Summer 7-30-2014

Executive Control in Hispanic Children: Considering Linguistic and Sociocultural Factors

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EXECUTIVE CONTROL IN HISPANIC CHILDREN: CONSIDERING LINGUISTIC AND SOCIOCULTURAL FACTORS

by

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A DISSERTATION

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Doctor of Philosophy

Major: Psychology

Under the Supervision of Professor Lisa J. Crockett

Lincoln, Nebraska

August, 2014

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University of Nebraska, 2014

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Executive control represents a collection of high-order cognitive processes that are associated with important child outcomes, including academic achievement and social competencies. Despite the burgeoning interest in examining the development of executive control, less is known about the development of these skills among ethnic minority children. Hispanic children are currently the largest ethnic minority group in the United States and their diverse sociocultural and linguistic backgrounds provide an excellent context to study the influence of linguistic and sociocultural factors on the development of child executive control. The purpose of the three complementary studies reported in this dissertation is to contribute to current literature on executive control by examining the effects of linguistic (i.e., Spanish-English bilingualism) and sociocultural (i.e., family socioeconomic status, parenting, and ethnic cultural values) factors on executive control among Hispanic preschoolers. Study 1 examines the validity of five neurocognitive tasks as assessments of executive control among bilingual Hispanic children. Study 2 considers the impact of Spanish-English bilingualism, as assessed by maternal reports of child language use and child vocabulary scores, on child executive control. Finally, Study 3 focuses on the effects of family socioeconomic status, parenting, cultural values and acculturative stress on child executive control. Study participants included 128 typically developing Hispanic preschoolers (i.e., three- to five-year-olds)

and their mothers. The following results are notable. In Study 1, the five neurocognitive tasks were found to be valid indicators of executive control, and four of the five tasks held equivalent measurement properties for the English and Spanish versions of the tasks. In Study 2, child English-Spanish bilingualism, as measured by child vocabulary (but not mother-reported language use), was associated with higher executive control. Finally, in Study 3, household income was associated with higher executive control, while parenting, cultural values, and acculturative stress were not. The results of these studies suggest that child bilingualism and household income may contribute to executive control in Hispanic children.

Dedication

This dissertation is dedicated to my beloved parents…for teaching me the value of perseverance and fostering my hunger for knowledge. *"El que persevera alcanza"*.

Acknowledgments

This dissertation would not have been possible without the consistent support and encouragement of my dissertation committee: Lisa Crockett, Lesa Hoffman, Kimberly Andrews Espy, Les Whitbeck, and Gustavo Carlo. Thank you for your invaluable feedback in preparing this dissertation and for fostering my intellectual development.

To Jennifer Mize Nelson, who offered incredible support and mentorship throughout the completion of this project. Thank you for maintaining my enthusiasm. Thank you to the DCN lab staff for teaching me everything I need to know about Executive Control. I am forever in debt to my undergraduate students; without your assistance in data collection and coding this project would not have been possible.

To my parents, Antonio and Margarita, and my sisters, Fátima, Noemí, and Flor: thank you for all of the sacrifices you have made so that I could complete my degree. You have inspired me to be the best person that I can be. I am also thankful to my friends, Cristabel Porras and Jesus Escobar, for their unrelenting encouragement and support. Finally, I would like to thank my fiancé, Brian Armenta —this journey would have been extremely lonely without you. Thank you keeping me company and drawing a smile on my face when I needed it the most.

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CHAPTER 1

Executive Control in Hispanic Children:

Considering Linguistic and Sociocultural Factors

Self-control—the ability to independently control one's thoughts and behaviors to achieve a goal or outcome—is one of the most important developmental milestones achieved during the preschool years (Garon, Bryson, & Smith, 2008). Central to the development of self-control is *executive control*, which refers to a collection of higher-order cognitive processes that allow a child to maintain information in mind, inhibit competing or irrelevant information, and flexibly shift when contingencies change in service of a goal (Espy, Sheffield, Wiebe, Clark, & Moehr, 2011). Executive control has been linked to important child outcomes, including cognitive (Bull, Espy, Wiebe, Sheffield, & Nelson, 2011; Clark, Pritchard, & Woodward, 2010) and socioemotional (Carlson & Moses, 2001) competence. As such, identifying factors that may influence the early development of executive control skills has important implications for understanding the development of self-control and overall child development more broadly.

Within the last two decades notable efforts have been made in the development and validation of measurement tools to assess executive control skills in preschoolers (e.g., Carlson, 2005; Espy, Kaufmann, McDiarmid, & Glisky, 1999; Zelazo, Müller, Frye, & Marcovitch, 2003). However, research in this area has been conducted primarily with European American children; consequently, evidence for the validity of existing executive control assessments with racial/ethnic minority children is limited (Willoughby, Blair, Wirth, & Greenberg, 2012). Hispanics are currently one of the largest and fastest growing ethnic minority groups in the United States (Pew Hispanic Center, 2012). Furthermore, demographic projections suggest that the number of Hispanic children will continue to increase rapidly within the next decade (U.S. Census Bureau, 2012). Hispanic children live in unique demographic, sociocultural, and linguistic contexts that shape the development of their cognitive abilities. Despite the growing need to understand the development of Hispanic children, empirical studies with this ethnic group are limited (Carlo & de Guzman, 2009), and there are even fewer investigations on the cognitive development of Hispanic children.

The majority of Hispanic children living in the U.S. are raised in bilingual contexts, often exposed to and interacting with English and Spanish speakers (Pew Hispanic Center, 2012). Interestingly, a growing number of empirical studies have documented a positive effect of bilingualism on general cognitive development, including executive control (see Bialystok, 2009 for a review). The observed bilingual advantage in executive control has been attributed to the practice of bilingual children in flexibly shifting between dual language codes (Bialystok, 1999). The generalizability of these findings, however, has been questioned due to limited sample characteristics (Carlson & Meltzoff, 2008; Morton & Harper, 2007). Specifically, most studies have been conducted with middle-class, non-Hispanic bilingual samples living outside of the U.S. (e.g., Bialystok & Barac, 2012; cf. Carlson & Meltzoff, 2008). Examining the effects of bilingualism on executive control of Hispanic children can provide evidence regarding the generalizability or specificity of these effects.

Understanding the factors that influence the early development of executive control may be particularly important for children from low socioeconomic status (SES) families. Research evidence suggests that experiencing poverty has negative consequences on the early development of executive control, thus placing children at greater risk for experiencing academic and behavioral difficulties (Bull et al., 2011; Espy et al., 2011; Hackman & Farah, 2009; Raver, McCoy, Lowenstein, & Pess, 2013). Taking into consideration that a high proportion of Hispanic children in the U.S. live in poverty (Pew Hispanic Center, 2012), understanding the links between poverty and executive control among this ethnic group and its potential consequences for academic and behavioral outcomes is a pressing issue.

The purpose of this dissertation is to contribute to current literature by providing the building blocks needed to begin studying the development of executive control in Hispanic children. To this end I conducted three complementary studies with a sample of Hispanic preschoolers. In Study 1 I evaluated the measurement properties and construct validity of five neurocognitive tasks intended to assess executive control. In Study 2 I examined the associations between Spanish-English bilingualism and child executive control. Finally, in Study 3, I considered parenting practices, Hispanic values (i.e., familism and respect), and acculturative stress as potential risk or protective factors in the association between family SES and child executive control.

The remainder of this chapter provides a brief summary of studies on executive control during the preschool years, followed by a selective summary of empirical studies examining the associations between child bilingualism and executive control and a summary of existing investigations on the influence of sociocultural factors on executive control. In Chapter 2 general information is presented regarding the methodology and overall analytic approach used in the three studies conducted for this dissertation. In

Chapter 3 detailed information regarding the psychometric characteristics of the neurocognitive tasks considered is presented, which includes an examination of the measurement equivalence of Spanish and English versions of the assessments. In Chapter 4 the independent and interactive associations between Spanish and English language use and vocabulary to child executive control are examined. In Chapter 5 the independent and interactive associations from sociocultural factors to child executive control are considered. Finally, in Chapter 6, the findings of three studies are summarized, and the implications of this research for understanding the development of Hispanic children are discussed.

Executive Control in the Preschool Years

Executive control is an encompassing term used to describe a collection of interrelated higher-order cognitive processes involved in coordinating goal-directed behavior and adaptive responses to novel or complex situations (Espy et al., 2011; Hughes, 2011). Various terms have been used interchangeably to refer to this complex construct (e.g., executive function, executive attention, self-regulation, effortful control, and cognitive control). The differences in terminology have been attributed to the use of diverse frameworks to study self-regulation within various sub-disciplines within psychology (e.g., Bridgett, et al., 2013). I will use the term *executive control* as it captures the idea that this construct involves “higher-order” processes responsible for coordinating and modulating lower-level primary processes, such as language, visuospatial perception and motor skills (Wiebe et al., 2011). Although discrepancies exist regarding the specific structure of executive control, three components are generally discussed in the literature, including working memory, inhibition, and set-shifting

(Friedman et al., 2008). Briefly, *working memory* refers to the mental processing space that allows for the retention of information in one's mind, including mentally manipulating or utilizing this information to guide one's behavior (Gathercole, Pickering, Ambridge, & Wearing, 2004). *Inhibitory control* refers to the ability to suppress an impulsive response and to control the interference of distracting information (Friedman & Miyake, 2004; Nigg, 2000). Finally, *set-shifting* (also referred to as *cognitive flexibility*) represents the ability to switch from alternative responses in line with changing contextual demands and task requirements (Miyake, Friedman, Emerson, Witzki, & Howerter, 2000). These higher-order cognitive processes are believed to work together to direct the lower-level cognitive processes responsible for regulating thoughts, emotions, and behavior.

Executive control develops throughout childhood, with significant growth during the preschool years (Carlson, 2005; Espy, 1997; Wiebe, Sheffield, & Espy, 2012). The typical development of executive control has been associated with important aspects of child psychosocial functioning, including social competence (e.g., Carlson & Moses, 2001) and academic achievement (e.g., Bull et al., 2011; Clark et al., 2010). Furthermore, early difficulties in executive control development have been linked to various childhood disorders, including Attention Deficit Hyperactivity Disorder (ADHD; Berwid et al., 2005; Martinussen, Hayden, Hogg-Johnson, & Tannock, 2005). Thus, examining the early development of executive control during the preschool years has important implications for understanding typical and atypical child functioning.

An important debate regarding the factor structure of executive control continues—specifically, whether executive control should be conceptualized as a unidimensional or multidimensional construct. The use of confirmatory factor analysis (CFA) to compare competing latent structural models has become a useful tool for determining the factor structure of executive control. Generally, in samples of older children and adults, a componential executive control structure (i.e., composed of 2 or 3 factors) is often supported, although the number and labels of the factors identified vary by study (Huizinga, Dolan, & van der Molen, 2006; Lehto, Juujärvi, Kooistra, & Pulkkinen, 2003; Miyake et al., 2000). In contrast, findings from recent investigations with preschool children suggest that a single-factor solution may best represent the structure of executive control during this developmental period (Espy et al., 2011; Hughes, Ensor, Wilson, & Graham, 2010; Shing, Lindenberger, Diamond, Li, & Davidson, 2010; Wiebe et al., 2011; Wiebe, Espy, & Charak, 2008; Willoughby, Blair, Wirth, & Greenberg, 2010). It is important to note, however, that support for the multi-factorial model of executive control in preschool children has been documented (Miller, Giesbrecht, Müller, McInerney, & Kerns, 2012), albeit not extensively. Moreover, scholars have suggested the possibility that the factor structure of executive control may transform from a unitary to componential structure as a result of developmental processes, similar to other general abilities (e.g., general intelligence; Garon et al., 2008). In this research I considered performance on five neurocognitive tasks as indicators of a single factor of executive control, as this factor structure has been supported by previous studies using similar tasks with non-Hispanic preschool children (Wiebe et al., 2011).

Executive Control in Hispanic Children

Despite the growing need to understand the development of Hispanic children, few studies have been conducted with this population. In addition, within the limited empirical studies that have included Hispanic participants, even fewer studies have examined constructs associated with cognitive development, including executive control. Executive control validation studies have focused primarily on multi-group comparisons based on child age, gender, and family SES (Hughes et al., 2010; Wiebe et al., 2011). In addition, relatively low proportions of Hispanic children—with requirements for English fluency—have been included in these studies. Thus, the validity of current assessments of executive control with ethnic minority samples has not been established. It is necessary to examine the measurement validity of executive control assessments with Hispanic children to determine whether these tasks assess a similar underlying construct (i.e., executive control) as they do for the samples they were originally developed with (i.e., primarily middle class European-American children).

Establishing the validity of executive control assessments with Hispanic children requires considering the linguistic diversity of this group. Thus the purpose of Study 1 is to culturally validate the Spanish and English versions of a battery of neurocognitive tasks as assessments of executive control with Hispanic preschool children. To my knowledge this has yet to be done. In addition, because the majority of Hispanic children are raised in bilingual environments, establishing the validity of executive control assessments for this ethnic group requires considering the measurement equivalence of Spanish and English versions of these tasks. Because the development of executive control represents a normative process that all children experience regardless of cultural background (Lewis & Carpendale, 2009), I expected the psychometric properties (i.e., factor structure, factor loadings, item intercepts) to be equivalent between Hispanic children who were administered the tasks in English or Spanish. In addition, to evaluate the construct validity of executive control assessment, I considered the association between child executive control and mother-reported child ADHD symptomatology (Willoughby et al., 2010), as contemporary accounts of ADHD have included executive control difficulties as a prominent characteristic of this disorder (Nigg, Willcutt, Doyle, & Sonuga-Barke, 2005).

Child Bilingualism and Executive Control

Significant differences have been identified in the language and cognitive performance of bilingual and monolingual children. For instance, compared to monolinguals, bilingual children have been found to perform more poorly on linguistic proficiency assessments, including vocabulary tests (Bialystok, Luk, Peets, & Yang, 2010). Growing empirical evidence, however, suggests that bilingualism (defined as the *regular* use of two languages) may also have a positive impact on non-verbal cognitive skills, including executive control. Specifically, bilingual children have shown to outperform monolinguals in assessments of executive control (Barac & Bialystok, 2012; Bialystok & Martin, 2004; Bialystok & Viswanathan, 2009; Carlson & Meltzoff, 2008; Yang, Yang, & Lust, 2011). The specific mechanisms responsible for the effects of bilingualism on child executive control, however, remain unclear.

Advantages in executive control among bilingual children have been attributed to their experiences managing two language systems (Bialystok, 1999). Contrary to early assumptions that bilingual speakers switched on and off between languages based to contextual demands, empirical evidence suggests that both languages remain active during language processing in the bilingual brain (e.g., Guttentag, Haith, Goodman, & Hauch, 1984). Thus, the simultaneous activation of both language systems can potentially result in interference from the non-relevant language. Bialystok (2001) argued that bilingual speakers prevent the interference of their non-relevant language by holding in mind the relevant language while also inhibiting the non-relevant language—skills associated with executive control. Thus, in general, advantages in executive control among bilingual children have been attributed to their extensive experience managing two language systems.

Empirical evidence for a bilingual advantage in executive control began with studies documenting positive effects of bilingualism on metalinguistic skills (e.g., Bialystok, 1986). Later, using the Dimensional Change Card Sort (DCCS) task, Bialystok (1999) reported that the bilingual advantage expands to other cognitive domains. In the DCCS task, participants are provided with a series of cards to sort by a single dimension (e.g., color) and then asked to switch and sort by a different dimension (e.g., shape). By approximately 3 years of age most children were able to correctly sort by the first dimension but had difficulties sorting according to a different dimension; that is, they continued to sort cards by the first rule presented. By 4 or 5 years of age, most children are able to correctly switch their card sorting according to a different rule. Young children's difficulties switching their card sorting by a new rule are attributed to their inability to cognitively represent complex rules (Zelazo et al., 2003) as well as limits in their working memory and inhibitory control (Diamond, Carlson, & Beck, 2005). Interestingly, Bialystok (1999) found that Chinese-English bilingual preschoolers performed significantly better in the DCCS task compared to their English monolingual counterparts, even after controlling for differences in verbal ability. Bialystok and Martin (2004) further examined the positive effects of bilingualism on the DCCS task in a sample of mixed bilinguals (i.e., Chinese-English; French-English) and English monolingual preschoolers using a modified version of the DCCS task, which included two inhibition conditions (i.e., inhibition with distraction and inhibition without distraction). In line with past studies, bilingual children performed better than their monolingual counterparts. The positive effects of bilingualism, however, were only found in the DCCS task version that involved inhibiting in the presence of a distraction, described as resisting attention to a previously relevant feature (e.g., shape) in order to represent the newly relevant feature (e.g., color). Furthermore, no differences were identified between bilingual and monolinguals in their ability to represent complex rules in the absence of distracting stimuli or inhibiting a motor response. Based on these finding, the authors suggested that the positive effects of bilingualism on executive control are potentially specific to inhibition tasks that require making a response when presented with distracting information.

Additional studies with mixed bilingual samples have provided support for bilingual advantages in inhibition skills. For instance, positive effects of bilingualism have been identified in the Simon Says task (Bialystok, Martin, & Viswanathan, 2005) and Ambiguous Figures task (Bialystok & Shapero, 2005). It is worth noting that bilingual advantages in executive control have been identified specifically in tasks that require selectively attending to a stimulus in the presence of distracting information, while no significant differences have been reported in behavioral inhibition tasks or tasks that assess other skills associated with executive control (Bialystok & Martin, 2004).

Limitations in previous research. As previously discussed, an important limitation of past research examining the effects of bilingualism on executive control is the limited diversity of the bilingual groups studied. If experience managing two languages leads to cognitive change, then similar effects should be found across bilingual children from diverse cultural backgrounds. Most studies, however, have examined the bilingual advantage in executive control among children of Asian background or mixed bilingual groups from families of moderate income (e.g., Bialystok & Martin, 2004; Bialystok, 1999). Carlson and Meltzoff (2008) highlighted the need to examine the generalizability of bilingual effects in participants of non-Asian background in order to rule out the possibility that aspects of Asian culture or SES differences, rather than bilingualism, are responsible for the observe bilingual effects. In support of a cultural explanation, monolingual preschoolers in Korea and China have been found to perform better in self-regulation assessments when compared to U.S. children (Carlson, 2009; Lewis & Carpendale, 2009; Sabbagh, Xu, Carlson, Moses, & Lee, 2006). Thus, it is likely that bilingualism, SES, and culture effects are confounded in bilingual studies with children of Asian background.

The majority of prior studies on the effects of bilingualism on executive control also have been conducted outside the U.S. (cf. Carlson & Meltzoff, 2008). The ethnic diversity of the U.S. provides an excellent setting to examine the generalizability or specificity of bilingualism effects on the development of child executive control. Study 2 of this dissertation seeks to expand current research in this area by examining the associations between Spanish-English bilingualism in low-income Hispanic children and executive control. Understanding the effects of Spanish-English bilingualism on the cognitive development of Hispanic children is of great interest and practical importance considering that the majority of bilingual children in the U.S. are Hispanic (Pew Hispanic Center, 2012).

Another limitation of current research is that most studies have relied on a limited number of tasks when assessing executive control (Carlson & Meltzoff, 2008), thus hindering the ability to determine the specificity of bilingualism effects. As previously noted, executive control is composed of diverse skills (Friedman & Miyake, 2004; Miyake et al., 2000); thus, multiple assessments are needed to capture the multifaceted nature of this construct. In addition, executive control represent tertiary skills that are deployed through basic skills, including language; thus, relying on a single test score to assess executive control is problematic as it is difficult to determine how much of child performance can be attributed to executive control vs. other basic skills (Wiebe et al., 2011). It is worth noting that most studies have examined skills associated with inhibitory control, while the impact of bilingualism on other executive control skills, specifically those associated with working memory and set-shifting, remain unstudied (Carlson & Meltzoff, 2008; Martin-Rhee & Bialystok, 2008).

Carlson and Moses (2001) suggested that assessments of executive control generally tap into two general domains: *delay* (i.e., withholding a prepotent response) and *conflict* (i.e., responding while withholding a prepotent response). Based on this theoretical conceptualization of executive control, Carlson and Meltzoff (2008) reported bilingual advantages in tasks associated with the conflict domain, but not in tasks associated with delay of gratification. Study 2 contributes to prior research by examining the association between Spanish-English bilingualism, based on maternal report of child language use at home and child performance on vocabulary tests, and executive control.

In addition, because Hispanic children vary in their level of bilingualism, I considered the independent and interactive associations of bilingualism (i.e., English and Spanish abilities and use) to executive control. In sum, the primary goal of Study 2 was to examine the associations between child bilingualism and executive control in a sample of Hispanic, Spanish-English bilinguals—a group not previously studied. I also considered whether this association remained significant after controlling for family SES.

Sociocultural and Familial Factors and Executive Control

In addition to linguistic factors, a separate line of studies has considered the role of sociocultural factors in the development of executive control. Prefrontal cortical systems that support executive control are characterized by protracted development; hence, there is an extended window of time in which socio-familial environment may shape executive control (Hackman & Farah, 2009). In support of this contention, family SES has been consistently identified as a significant predictor of child performance on executive control assessments (e.g., Farah et al., 2006; Hughes & Ensor, 2005; Mezzacappa, 2004; Noble, McCandliss, & Farah, 2007). Emerging evidence suggests that chronic exposure to economic hardship may alter the executive control development of children (Arnsten & Li, 2005; Blair, Raver, Granger, Mills-Koonce, & Hibel, 2011). Specifically, children from families who face greater poverty have been found to exhibit compromised neuroendocrine stress responses, which in turn have been linked to poor cognitive and behavioral self-regulation (Blair et al., 2008; Raver et al., 2013). In support of this model of experiential canalization, growing evidence suggests that poverty-related stressors are linked with a higher allostatic load (Evans, 2003) and compromised executive control (Blair, 2010; Evans & Schamberg, 2009).

Parental investment and parental stress perspectives are two common frameworks used when studying the associations between socio-familial factors and child development (Yeung, Linver, & Brooks-Gunn, 2002). The parental investment perspective posits that having higher SES affords greater access to learning resources and stimulating interactions. In support of this perspective, studies have shown parental scaffolding during problem-solving assessments to be positively associated with child performance on executive control tasks (Bernier, Carlson, & Whipple, 2010; Hughes & Ensor, 2009). In a complementary manner, parental stress perspectives focus primarily on parental well-being and access to social supports. Parental stress and limited access to social support may limit the emotional availability of parents, leading to less warm or contingent interactions with their children. Thus, identifying the specific role of learning resources and social stressors on the development of child executive control is important as such factors may be responsive to intervention efforts. Considering that approximately two thirds of Hispanic children come from low-SES families, understanding the role of poverty is crucial when examining child development in this ethnic minority group (e.g., Cauce, 2008). Thus, in Study 3 I considered the associations from maternal education and household income (as indicators of family SES) with child executive control in a sample of Hispanic preschoolers.

Parenting and executive control. In addition to socioeconomic factors, a growing number of studies have considered the influence of parenting practices on child executive control (e.g., Bernier et al., 2010; Hammond, Müller, Carpendale, Bibok, & Liebermann-Finestone, 2012; Hughes & Ensor, 2009; Noble et al., 2007). Within this area the majority of studies have focused on the effects of maternal scaffolding on child executive control (e.g., Bibok, Carpendale, & Müller, 2009; Dilworth-Bart, Poehlmann, Hilgendorf, Miller, & Lambert, 2010; Smith, Landry, & Swank, 2000). Interest in examining specific parenting practices (e.g., nurturance and consistency), however, is beginning to emerge (Bernier et al., 2010; Carlson, 2009; Hughes & Ensor, 2005). In this section empirical research on the associations between early parenting and child executive control during the preschool years is briefly summarized.

Interest in the association between parenting and child executive control began with studies in which maternal scaffolding was identified as a significant predictor of general child cognitive abilities (Landry, Smith, Swank, & Miller-Loncar, 2000). Broadly defined, *scaffolding* is a complex process through which caregivers support children's problem-solving skills in a sensitive, responsive, and effective manner. Thus, scaffolding sets the context in which children use their executive control skills and receive feedback regarding the appropriateness of their responses. In line with sociocultural theorists, executive control scholars have suggested that caregivers may facilitate the development of executive control by initially organizing their child's activities and ultimately preparing their child to gradually direct their own behavior (Landry et al., 2000). Because it is a complex, multi-step process, most studies have focused on a single aspect of scaffolding. Specifically, maternal verbal scaffolding (i.e., verbal utterances that guide child behavior) has received the most attention (Bernier et al., 2010; Dilworth-Bart et al., 2010; Matte-Gagné & Bernier, 2011; Smith et al., 2000)

Although research on the associations between parental scaffolding and child executive control is relatively new, some patterns are beginning to emerge. First, parental verbal scaffolding may promote child executive control indirectly by fostering child verbal skills (Landry, Miller-Loncar, Smith, & Swank, 2002). Second, the positive effects of parental verbal scaffolding on child executive control are age dependent. Specifically, verbal scaffolding appears to be particularly beneficial for fostering executive control in young children, but its value may deteriorate as children age and become more independent (Landry et al., 2000; Smith et al., 2000). Third, some forms of parental verbal scaffolding may be more effective in promoting child executive control than others. For instance, parental statements that elaborate on the child's behavior are thought to foster the development of child executive control because they provide a more verbally and conceptually rich understanding of a task, thus contributing to child cognitive growth. In contrast, parental statements that direct child behavior may foster the cognitive development of younger children, but may become intrusive for older children as they learn to independently regulate their behavior (Landry et al., 2000). Fourth, in addition to content, it has been suggested that the emotional tone used when delivering scaffolding-related statements influences its effectiveness in promoting child executive control (Dilworth-Bart et al., 2010). Parents' emotional support may foster children's regulatory competencies by influencing children's disposition to comply with parental messages and may also provide the motivation needed for children to behave in a socially acceptable manner (Grusec & Goodnow, 1994).

Other parenting practices associated with child executive control. The interest of current studies in parental scaffolding as the primary socialization process associated with the development of child executive control can be attributed to the prevalence of Vygotsky's (1978) ideas in explaining the impact of social experiences on child cognitive development. While the importance of parental scaffolding on the development of executive control and other cognitive skills is widely recognized, interest in more specific socialization mechanisms as potential antecedents of child executive control is on the rise (Bernier et al., 2010; Carlson, 2003; Hughes & Ensor, 2009; Matte-Gagné & Bernier, 2011).

For instance, Hughes and Ensor (2009) systematically compared the influence of four different socialization models (i.e., positive parenting, negative parenting, modeling, and scaffolding) on the development of child executive control in a sample of preschoolers. *Positive parenting* included mother–child positive talk and calm parental responses to the child's transgressions. Hughes and Erson suggested that mother-child talk fosters executive control by promoting child language abilities, which, as discussed earlier, have been implicated in the development of executive control (Smith et al., 2000). In addition, calm parental responses to children's negative emotions were argued to foster child executive control because such parental reactions have been associated with better effortful control skills—an emotion regulation concept related to executive control. The second model examined was *negative parenting*, which included disorganization and unpredictability in family life, which are believed to have an unfavorable impact on the development of child executive control. The third parenting model examined was *modeling,* which was argued to foster child executive control by demonstrating planning and goal-directed behaviors that are eventually internalized as part of children's repertoire of problem-solving behaviors. The fourth parenting model examined was *scaffolding*, which included parental support and guidance while children completed a goal-directed activity. Child executive control was assessed with a battery of behavioral tasks at 2 and 4 years of age. After controlling for child verbal ability and executive control skills at age 2, all the parenting models examined at age 2 predicted child executive control at age 4, except for positive parenting. Specifically, neither of the two measures of positive parenting (i.e., mother-child talk and calm responses to child's transgressions) was associated with child executive control. Negative parenting (i.e., family chaos and inconsistent parenting) at age 2 were associated with a lack of improvement in executive control. The association between maternal modeling and executive control was partially supported, as modeling during one of the two tasks examined was significantly associated with child executive control at age 4. Finally, similar to the studies previously discussed, maternal scaffolding at age 2 was positively associated with child's executive control at age 4. In brief, Hughes and Erson's findings suggest that in order to have a more complete understanding of the influence of parenting behaviors on the development of executive control, it is necessary to examine incidental parenting practices as well as deliberate parental efforts.

Similarly, Carlson (2003) argued that three parenting dimensions foster the development of executive control, including sensitivity, mind-mindedness, and scaffolding. *Sensitivity* was conceptualized as appropriate and consistent responses to children's signals, which were believed to foster executive control by contributing to the quality of parent-child interactions and motivating children to develop self-control. *Mind-mindedness* was defined as the tendency to use mental terms when talking to children, which ostensibly provides children with the verbal tools necessary to make the transition from being externally regulated to being internally regulated (i.e., self-regulated). Finally, *scaffolding* was conceptualized as caregivers' efforts to provide children with problem solving strategies that are age-appropriate and likely to lead to a successful experience and learning. Carlson suggested that each of these parenting dimensions influence the development of child executive control differently as result of their distinct features.

Following Carlson's (2003) theoretical suggestions, Bernier and colleagues (2010) empirically examined the effects of maternal sensitivity, autonomy support (including scaffolding), and mind-mindedness on child executive control in a sample of toddlers. Bernier et al. hypothesized that high quality parenting, characterized by high maternal sensitivity, mind-mindedness (both assessed at 12 months), and autonomy support (assessed at 15 months) would foster later executive control (assessed at 18 and 26 months). After controlling for overall child cognitive functioning, early maternal sensitivity and autonomy support positively predicted child performance in conflict executive control tasks at 26 months, while the association between maternal mind-mindedness and child conflict executive control at 26 months was only marginally significant. In contrast, none of the parenting dimensions examined was associated with impulse control executive control at 26 months. Furthermore, when examining the unique and common contribution of parenting on conflict executive control, only autonomy support remained uniquely associated. In sum, although maternal sensitivity and autonomy support were associated with child conflict executive control, autonomy support was the strongest parenting predictor.

In sum, there is growing interest in examining parenting behaviors other than scaffolding as potential predictors of child executive control. The precise mechanisms through which parenting influences child executive control remain unknown, however, due to the lack of specificity regarding the parenting behaviors examined across studies as well as differences in the assessment of child executive control. In Study 3 I examined the associations between maternal parenting practices (i.e., nurturance and consistency) and child executive control performance. I predicted that maternal nurturance would be positively associated with child executive control, as nurturance fosters harmonious parent-child interactions, which promote secure parent–child attachment and may facilitate the internalization of parental messages (e.g., Grusec & Goodnow, 1994). In addition, I predicted that maternal consistency would be positively associated with child executive control, as consistency provides structure and expectancies which assist in organizing children's goal-directed and problem-solving activities (e.g., Hughes and Enson, 2009).

Cultural factors and executive control. Although examining the effects of SES and parenting behaviors on child executive control is informative, it is not sufficient to understand the impact of sociocontextual factors on the development of executive control in Hispanic children. Scholars have recognized the need to incorporate cultural factors when examining the development of ethnic minority children. For instance, García-Coll and colleagues (1996) proposed a conceptual model for the study of child development in minority children living in the U.S. that highlights the need to consider factors that are unique to ethnic minority populations. This included, for example, ethnic cultural values and adaptation to the mainstream culture as moderators of the associations between SES and child developmental outcomes. Based on these suggestions, I evaluated a model in which traditional Hispanic cultural values (i.e., *familism* and *respect*) and family stress originating from acculturation difficulties (i.e., acculturative stress) interact with family SES and parenting practices in predicting child executive control.

Sociocultural perspectives posit that in order to understand child development, it is necessary to examine the context in which development occurs, including the values and norms endorsed by a specific cultural group (Rogoff, 1990). Caregivers are responsible for transmitting to their children the cultural values and practices needed to successfully function within a specific society. Children learn problem-solving and task-management skills through their interactions with caregivers, in which cultural values endorsed by caregivers likely determine the nature (i.e., how, where, and when) of these interactions (Gauvain, Fagot, Leve, & Kavanagh, 2002). Thus, according to sociocultural perspectives, children learn to think and make sense of their world through social exchanges with caregivers, who are responsible for interacting with them according to cultural norms (Vygotsky, 1978).

Sociocultural perspectives draw heavily on the theoretical work of Vygotsky (1978) and other contemporary theorists (for reviews, see Rogoff, 1990; Wertsch & Tulviste, 1999). Vygotsky’s (1978) main theoretical claim was that the development of higher-order mental functions originates from social interactions in which adults (and competent peers) guide and support children’s problem-solving strategies. In addition, cultural values shape the way in which parents perceive and interact with their children. For instance parents who endorse traditional Hispanic values likely scaffold their children to behave in ways that are socially acceptable within their culture. Such culture-specific-scaffolding, in turn, begins shaping child development and self-regulatory competencies. In other words, parents who endorse the values of *familism* and *respect* likely correct their child’s behavior to comport with these specific values, which in turn may influences the development of specific self-regulatory skills, including executive control.

Familism and respect. Hispanic families living in the U.S. have been described as a collectivistic cultural group that values connectedness and interdependence (Oyserman, Coon, & Kemmelmeier, 2002). It should be noted, however, that Hispanics represent a heterogeneous group with diverse immigration histories, national origins, education, and SES (Guarnaccia et al., 2007). Consistent with a collectivistic orientation, Hispanics have been reported to value familism and respect as means of fostering and maintaining collective well-being, including that of the family and community (Cauce & Domenech-Rodríguez, 2002).

Familism highlights the need to maintain strong family ties, including the expectation that the family is the primary source of support (i.e., emotional and instrumental), feelings of loyalty to the family, and commitment to the family over individual needs and desires (Knight et al., 2011). The endorsement of familism values has been identified as a protective factor for Hispanic families. For instance, Hispanic parental endorsement of familism values has been identified as an important protective factor against adolescent engagement in problematic behaviors (Germán, Gonzales, & Dumka, 2009; Lac et al., 2011). In addition, familism has been found to moderate the association between parenting and preschoolers' socio-emotional adjustment in Mexican American families, such that associations between parenting and child adjustment were stronger for families in which parents reported higher levels of familism (Gamble & Modry-Mandell, 2008). Current investigations; however, have focused on understanding the role of familism values on Hispanic adolescent development, while less is known about the role of these cultural values in predicting early childhood outcomes, including executive control.

Respect is another important value identified in the Hispanic literature. Respect can be defined as efforts to maintain interpersonal relationships through respect for the self and others. Valdés (1996) suggested that the Spanish term "*respeto*" is more comprehensive than the English term "respect." Specifically, *respeto* includes respecting the hierarchical role of each family member, and behaving in a courteous, socially acceptable manner (especially towards elders). In addition, *respeto* emphasizes children's duty to show respect for and obey the advice of their parents (Garcia, 1996). Although I agree with Valdés' arguments, I will use the term respect in order to be more consistent with the majority of the literature. I will, however, consider the cultural construct of respeto as discussed by Valdés. In adolescent samples, respect has been identified as a protective factor against substance use (Lorenzo-Blanco, Unger, Ritt-Olson, Soto, & Baezconde-Garbanati, 2013). Similar to familism, less is known about the associations between the endorsement of respect and early child development. Although empirical evidence on the role of familism and respect on early childhood development is limited, scholars support the need to examine the role of these ethnic cultural values in processes that shape Hispanic children's self-regulatory competencies (Chase-Lansdale, Valdovinos D'Angelo, & Palacios, 2007; Li-Grining, 2012; Melendez, 2005). It is possible that Hispanic cultural values may interact with parenting practices and family SES in predicting the development of executive control.

If familism and respect represent sources of emotional support and structure for Hispanic children, it is possible that these cultural values play a protective role in the associations between parenting, family SES, and the development of executive control. Hispanic cultural values may interact in several ways with parenting and family SES in predicting child executive control. For instance, it is possible that a two-way interaction between Hispanic cultural values and parenting may predict child executive control, such that the positive effects of parenting on child executive control are stronger for children from families that endorse higher levels of Hispanic cultural values. In addition, it is possible that a two-way interaction between Hispanic cultural values and family SES may be at work, such that the negative effects of low family SES on child executive control are buffered by the endorsement of Hispanic cultural values. Finally, a three-way interaction should be considered in that the positive effects of parenting on child executive control may be promoted by higher endorsement of cultural values, but influenced by family SES, such that the positive effects of cultural values and parenting are only significant for families with a lower SES.

Acculturative stress. When examining the development of Hispanic children, it is necessary to consider not only the endorsement of central Hispanic values but also the degree to which family members have adopted the values and attitudes associated with the mainstream culture. Acculturation is defined as the adoption of values and attitudes from other cultural groups (Berry, 2007). Scholars have suggested that biculturalism, defined as the adoption of ethnic and mainstream cultures, is associated with better outcomes for Hispanic children (Baumfield, 2007; Galindo & Fuller, 2010). Hispanic parents, especially recent immigrants, however, may experience stress and anxiety as a result of cultural incompatibilities between their ethnic cultural values and those endorsed by the mainstream culture, which is often referred to as acculturative stress (Flores et al., 2002). Considering that approximately 52% of Hispanic children have at least one parent who is foreign-born (Pew Hispanic Center, 2012), is it important to examine the role of Hispanic parents' acculturative stress on the development of executive control.

Parental acculturative stress might interact with parenting and family SES in predicting child executive control in various ways. For instance, it is possible that a two-way interaction between acculturative stress and parenting may predict child executive control, such that the positive effects of parenting on child executive control are reduced for families who experience higher levels of acculturative stress. In addition, it is possible that a two-way interaction between acculturative stress and family SES may be at work, such that the negative effects of low family SES on child executive control are exacerbated by experiencing higher levels of acculturative stress. Finally, a three-way interaction should be considered in which the positive effects of parenting on child executive control are reduced by experiencing higher levels of acculturative stress, particularly for children from low SES families.

The purpose of Study 3 is to examine the independent and interactive associations between culture-specific variables (i.e., Hispanic cultural values and acculturative stress) and executive control among Hispanic preschool children. Based on current executive control socialization research (e.g., Bernier et al., 2010), family-stress theory (Yeng et al., 2002), and Garcia-Coll et al.,'s (1996) model of ethnic child development, I considered two-way and three-way interactions between parenting, family SES, and culture related variables in relation to child executive control. I hypothesized that the endorsement of familism and respect would promote the positive effects of parenting on child executive control, especially for children from low SES families. On the contrary, I predicted that family acculturative stress would reduce the positive effects of parenting on child executive control, especially for families from low SES.

Present Studies

The purpose of this dissertation is three-fold: first, to evaluate the factor structure and measurement validity of a battery of neurocognitive executive control tasks with Hispanic children; second, to investigate the effects of child Spanish-English bilingualism on EC; and third, to consider the influence of sociocultural factors commonly associated with the experiences of Hispanic families living in the U.S. on child executive control. These studies provide unique insight into the development of executive control in Hispanic children in various ways. First, having valid assessments of executive control is crucial for setting the foundation to begin to understand the development of these important skills in Hispanic children. Second, identifying the associations between bilingualism and executive control in Hispanic children can provide information regarding the potential impact of bilingual education programs on cognitive development. Third, identifying protective and risk factors associated with Hispanic culture has important implications for beginning to disentangle the contribution of contextual effects on child executive control development in this understudied ethnic group.

Summary of Research Hypotheses

Study 1. Based on previous executive control studies with preschool samples using similar tasks to the ones included in this study (see Wiebe et al., 2008; 2011), I predicted that performance of Hispanic children in the tasks considered would be represented by a single factor of executive control. I further predicted that the unitary latent executive control structure will provide the best fit to the data regardless of whether Hispanic children completed the study in English or Spanish, as executive control represents normative cognitive processes experienced by all children regardless of cultural experiences. Finally, in line with previous studies with non-Hispanic children (e.g., Espy et al., 2011), I predicted that performance on executive control tasks would be negatively associated with maternal reports of ADHD symptomatology, thus providing evidence of criterion validity.

Study 2. Based on previous studies with bilingual children from other language groups (e.g., Bialystok, 1999; Carlson & Meltzoff, 2008), I predicted that child bilingualism (as indicated by maternal reports of child language use at home and child performance on vocabulary assessments) would be associated with higher executive control. I also expected that bilingualism would be positively associated with behavioral tasks associated with inhibitory control. No a priori hypotheses were made regarding the associations between bilingualism and working memory or set-shifting as such aspects of executive control have not been previously considered. Furthermore, I expected that the associations between bilingualism and EC to remain significant, after controlling for family SES.

Study 3. Based on previous studies with non-Hispanic samples, and in line with parental stress perspectives (Yeng et al., 2002), I expected that lower family SES would be associated with lower child executive control. In addition, I expected parenting practices, specifically nurturance and consistency (Bernier et al., 2010; Hughes & Ensor, 2009), to be positively associated with child executive control. Finally, in line with emerging research on socialization in Hispanic families (Garcia-Coll et al., 1996), I expected central cultural values (i.e., familism and respect) and family acculturative stress to moderate the associations between lower family SES, parenting, and child executive control. Specifically, I expected that maternal endorsement of ethnic cultural values would buffer the negative association between low SES and child EC. On the contrary, I expected that higher maternal acculturative stress would exacerbate the negative association between low SES and child EC.

CHAPTER 2

Method

Participants

The sample consisted of 128 Hispanic preschool children (i.e., 3- to 5-year olds) and their biological mother. Participants resided in a Midwest state with a growing proportion of Hispanic families. For the purpose of this study, children were considered Hispanic if at least one of their biological parents self-identified as Hispanic. Monthly household income ranged from $600 to $8,500, with an average of $1,979 (*SD* = 1,046). Family size ranged from 2 to 10 people per household, with an average of 4.8 individuals (*SD* = 1.3) individuals, which included children and adults. Children diagnosed with neurological, developmental, psychiatric, or congenital disorders were excluded from participation as the overall purpose of this research program is to characterize the normative development of executive control. Of the 152 families who demonstrated interest in participating in the study, 14% were not eligible because children did not meet the age and/or health requirements. Furthermore, of the 130 families who attempted to complete the study, one was unable to complete the study because of child speech difficulties and one decided not to complete the study. Thus, the information reported here includes data from 128 families who meet the study requirements and completed the data collection session.

Of the 128 children, 50% were girls and had an average age of 4.6 years (*SD* = .78; Range = 3.33 to 5.92). Of all the children, only 4.7% were foreign-born and immigrated to the United States at an average age of 2.6 years (*SD* = 1.8). A total of 62.5% children were administered the study tasks in Spanish and 37.5% in English.

The majority of the mothers (91.4%) were born outside the United States, including Mexico (80.3%), Guatemala (6.8%), and El Salvador (6.8%); these mothers migrated to the United States at an average age of 22 years (*SD* = 7.3). In general, most mothers reported Spanish as their first language (97%) and the majority (82.8%) reported speaking Spanish at home most or all the time. Of the 128 mothers, 58.6% did not complete high school, 21.9% completed high school or a GED, 14.9% completed some college, and 4.7% completed a bachelor's or master's degree. Only 21.9% of the mothers completed their education in the U.S. Most of the mothers decided to complete the study interview in Spanish (91.4%).

Procedure

All study materials, including parent questionnaires, child task scripts, and advertisement materials were translated into Spanish by the principal investigator of the study, who is a native Spanish speaker, and back-translated into English by a second bilingual translator, who is a native English Speaker. Translation discrepancies were resolved in discussion between the translators. In addition, Spanish translations were refined by the study interviewers, who were Spanish-English bilinguals from diverse Latin-American backgrounds. Furthermore, the Spanish translation of study questionnaires and child task scripts were pilot tested with five Hispanic families to ensure all instructions and question items were clear prior to beginning data collection.

A multi-faceted recruitment approach was implemented to overcome potential difficulties related to the limited participation of Hispanic families in university-based research (Haack, Gerdes, & Lawton, 2014). First, study flyers were displayed and distributed at local elementary schools, community agencies, and organizations serving

Hispanic families. Second, the principal investigator of the study verbally invited interested families during face-to-face interactions at churches, community centers, health clinics, and daycare centers. Third, after completing the study session, participating families were provided with study flyers to share with their acquaintances and a letter was sent home thanking them for their participation and inviting them to share information about their study experiences with other families.

Families interested in participating in the study provided their contact information and reported their child's sex, ethnicity, and existing psychiatric and medical diagnoses (prescreening questions are included in Appendix A). Families with children who met the study requirements for age (i.e., 3 to 5 years of age), ethnicity (i.e., at least one parent self-identified as Hispanic), and health (i.e., no pervasive developmental or health conditions), completed screening procedures over the telephone in which further questions about child language use at home, age at which developmental milestones (e.g., sitting up, walking, talking) were achieved, and diagnosis and treatment of medical conditions (screening questions are provided in Appendix B). Children previously diagnosed with developmental, language delays, or behavioral disorders were not further considered for the study participation. Eligible families were scheduled to complete a single 2-hour data collection session at a convenient time. Transportation to the research lab and child care was provided upon request.

At the beginning of the data collection session, the mother received instructions about the data collection procedures and provided written informed consent for herself and her child to participate in the study. The mother and child remained together during the assessment to minimize potential child separation anxiety, except during the administration of the Snack Delay task (described below), in which the mother was asked to watch the child through a one-way mirror outside the testing room. This task was administered after the child was familiar with the examiner and testing environment. The child completed the study tasks with the principal investigator of the study, while the mother completed an interview in her preferred language (i.e., English or Spanish) with a bilingual research assistant. The principal investigator of the study and the child were seated at a small table across from each other or adjacent to each, while the mother and interviewer were seated at a table located in a corner of the same testing room. Before administering the study tasks, the child's dominant language was determined based on his or her scores on English and Spanish standardized vocabulary assessments (as described below). In addition, as part of the screening procedures, information regarding the child's Spanish and English language use at home was obtained through mother's reports. The child's English and Spanish vocabulary scores together with the mother's report of child language were used to determine the language in which the rest of the child assessments were administered. The examiner provided task instructions and feedback to the child in the selected language (English or Spanish); however, children were allowed to provide verbal responses in English or Spanish. Data collection sessions were videotaped to allow for subsequent behavioral coding. At the end of the study, the mother received a gift card (i.e., $75 for local families; $100 for out-of-town families) and the child received an age-appropriate toy as compensation for their time and travel expenses.

Measures

Mother assessments. During the interview, mothers provided general demographic information about their family, child health and development, child language use, and their endorsement of ethnic Hispanic cultural values and parenting practices.

Family socioeconomic status. Mothers reported the total household yearly income from all sources of financial support. To correct for non-normality, the household income variable was log-transformed and reflected, such that higher numbers indicate lower income. In addition, mothers reported their highest educational degree completed, with responses ranging from 1 = *doctorate* to 9 = *eight grade or less*. These two variables were evaluated as indicators of *low* family SES.

Child ADHD symptoms. The Child Behavior Checklist for Ages 1½–5 (CBCL 1½–5; Achenbach & Rescorla, 2000) was used to assess child ADHD symptoms. The CBCL 1½–5 is a widely used questionnaire that assesses a variety of developmental, behavioral, and clinical domains. Only items corresponding to the *ADHD DSM-Oriented Subscale* (6 items) were used in the present study. Mothers indicated how well each item described their child's behavior during the past 2 months, using a 3-point scale (0 = *Not True*, 1 = *Sometimes True*, 2 = *Often True*). The CBCL 1½–5 has demonstrated good test-retest reliability (α range = .79 to 90), and overall internal consistency (α range = .72 to .91; Achenbach & Rescorla, 2000). In the present study, the alpha coefficient for the ADHD DSM-Oriented Subscale items was low (α = .52). Given the small sample size, the low number of items, and the ordinal response scale, this was not unexpected (John & Benet-Martínez, 2000).

Parenting practices. The Parenting Dimension Inventory-Short Version (PDI; Power, 2002; Slater & Power, 1987) was used to assess maternal parenting practices. The PDI is a multidimensional self-report inventory that assesses parenting attitudes and behaviors, including *Nurturance* (6 items; e.g., “I encourage my child to be curious, to explore, and to question things”) and *Inconsistency* (4 items; “My child convinces me to change my mind after I have refused a request”). Mothers reported how much each item described their attitudes or behaviors towards their child, using a 6-point scale, anchored by 1 (*Does not describe me at all*) and 6 (*Describes me very well*). The PDI-S has demonstrated acceptable psychometric properties and internal consistency (α range = .68 to .83) with Hispanic samples (De Von Figueroa-Moseley, Ramey, Keltner, & Lanzi, 2006). In the current study, the Nurturance (α = .76) and Inconsistency (α = .77) items demonstrated good internal consistency. To facilitate the interpretation of study results, all of the inconsistency items were reversed scored, such that higher values indicate higher levels of maternal consistency.

Hispanic cultural values. An adaptation of the Mexican-American Cultural Values Scale (MACVS; Knight et al., 2010) was used to assess values associated with Hispanic culture. The MACVS is a measure of traditional cultural values that was created based on a series of focus groups with Mexican Americans adolescents and adults. Only items pertaining to the familism and respect subscales were used in this study, including *Familism-Support* (6 items; e.g., “Parents should teach their children that the family always comes first”), *Familism-Obligation* (5 items; e.g., “Children should be taught that it is their duty to care for their parents when their parents get old”), *Familism-Referent* (5 items; e.g., “Children should always do things to make their parents happy”), and *Respect* (8 items; e.g., “Children should never question their parents’ decisions”). Mothers indicated how strongly they believed each statement on a 5-point scale, anchored by 1 (*not at all*) and 5 (*completely*). Knight and colleagues (2010) reported the following internal consistency for each subscale: Familism-Support (α = .58), Familism-Obligation (α = .55), Familism-Referent (α = .63), and Respect (α = .52). In the current study, low to good internal consistency values were found: Familism-Support (α = .66), Familism-Obligation (α = .57), Familism-Referent (α = .64), and Respect (α = .75). Furthermore, CFAs were estimated to evaluate the dimensionality of the cultural items.

Acculturative stress. The Social, Attitudinal, Familial, and Environmental Acculturative Stress Scale (SAFE; Mena, Padilla, & Maldonado, 1987) was used to assess stress resulting from acculturative processes. This 24-item scale assesses acculturative stress experienced in four domains: social, attitudinal, familial, and environmental. Mothers indicated how stressful they found each experience to be using a 5-point scale, ranging from 1 (not at all stressful) to 5 (completely stressful). Higher scores indicate higher levels of acculturative stress. Mena et al. (1987) reported adequate internal consistency for the overall scale (α = .89). However, Mena et al. did not specify which items belong to each one of the domains. Fuertes and Westbrook (1996) proposed that 21 of the items were indicative of 4 different factors, including environmental (10 items; e.g., “Because I am different, I do not get enough credit for the work I do”), attitudinal (4 items; e.g., “It is hard to express to my friends how I really feel”), social (4 items; e.g., “I don't have any close friends), and familial (3 items; e.g., “It bothers me that family members I am close to do not understand my new values”) domains. Internal consistency for the overall scale (α = .89) and each subscale (α range = .70 to .88) was good based on Fuertes and Westbrook. Suarez-Morales, Dillon, and Szapocznik (2007) later reported that a two-factor solution provided the best fit for the SAFE items, including perceived discrimination (8 items; α = .79) and immigration-related stress (4 items; α = .72) (only 12 of the 24 items were included in their study). CFAs were conducted to examine the dimensionality of the acculturative stress items. To facilitate the interpretation of study results, all of the acculturative stress items were reversed scored, such that higher values indicate lower levels of acculturative stress.

Child assessments. Children completed picture vocabulary assessments in English and Spanish to determine their dominant language at the beginning of the data collection session. All the study assessments, including the executive control tasks, were administered in a fixed order to keep potential fatigue effects constant across participants.

Language use. The English and Spanish vocabulary tests of the Woodcock-Muñoz Language Survey-Revised (WMLS-R; Woodcock, Munoz-Sandoval, Ruef, & Alvarado, 2005) were used to determine child's dominant language in which the rest of the tasks were administered. For the vocabulary tests, children were asked to point to or name pictured objects displayed on an easel. These tests evaluate oral language, including language development and lexical knowledge in English and Spanish. Mothers' reports of child language use at home that were collected during the screening process (items are included in Appendix B) were used in combination with child vocabulary tests scores to determine the child's dominant language. If similar scores were obtained on the Spanish and English vocabulary tests and mothers' reports of child's language use, then the child was asked to choose the language in which the rest of the assessments were administered. Because the majority of children are expected to have exposure to both English and Spanish, all children completed the English (M = 75.28, SD = 21.03) and Spanish (M = 80.33, SD = 22.45) vocabulary tests.

Executive control. A battery of five behavioral neurocognitive executive control tasks was administered to the child. In prior studies with non-Hispanic preschool children these tasks have been administered successfully and have demonstrated good psychometric properties (Espy, 1997; 1999, 2001; 2003; Wiebe et al., 2011). Furthermore, pilot testing for the present study was successfully completed with Hispanic children prior to beginning of data collection. The tasks included represent traditional theoretical components of executive control, including working memory, inhibitory control and set-shifting. In addition, the tasks varied in presentation format and response demands to keep children engaged during the assessment. Computerized tasks (i.e., Go/No-Go, Shape School, and Snack Delay) were administered using E-Prime 1.1 (Psychology Software Tools, Pittsburgh, PA, USA). Children responded to the Go/No-Go task via button press, whereas the other tasks were scored offline by trained undergraduate research assistants. With the exception of Go/No-Go, 20% of the sessions were randomly selected to be coded a second time to evaluate inter-rater reliability. The order of administration, child response to each task, and dependent variables are described in Table 2.1.

Table 2.1

Child Response Format and Dependent Variable for Neurocognitive Tasks

Task	Child Response Description	Dependent Variable
Go/No-Go	Children pressed a button to catch fish and suppressed pressing the button when presented with sharks	Proportion correct responses on No-Go trails
Trails	Children stamps dogs and followed by their corresponding bones from smallest to biggest	Efficiency score = total correct stamps / total number of stamps
Shape School (Inhibit)	Children name the color of students with happy faces and suppresses naming the students with sad faces	Proportion of correct responses on inhibit trials
Shape School (Switch)	Children name the color of the students without hats and the shape of the students wearing hats	Proportion of correct responses on switch trials
Snack Delay	Children stand still without moving or talking before eating a snack	Summary of hand movement = .5 point for each epoch with some movement or 1 point for each epoch with no hand movement
Noisy Book	Children reproduce sequences of animals on a touch screen that are progressively longer	Correct trial total = .33 for each correct practice trial + 1 point for each correct test trial

Note. Shape School is a single task from which two different conditions were examined.

Go/No-Go (adapted from Simpson & Riggs, 2006) is a widely used computerized task to assess inhibitory control. Children were presented with cartoon fish and shark images that were individually displayed on a computer screen. Children responded to the task by pressing a button. During the *go* trials, children were instructed to press the button to “catch” the fish. Conversely, during the *no-go* trials children were instructed to “let it go” and suppress pressing the button when they saw a shark. Feedback was provided with a picture of a fishing net, which broke when children made an error by pressing the button in response to a shark. The fish and shark stimuli appear on the screen for 1500 msec, with 1000 msec between each stimulus; 25% of the stimuli were sharks. Before completing this task, children were asked to practice pressing the button to ensure they had the necessary motor skills to complete the task. In total, 5 children (4%) had missing data because they were unable to press the button to respond to the task.

Trails (modified from Espy & Cwik, 2004) is an assessment of set-shifting skills. Children were presented with a storybook about a family of dogs composed of 6 members, including: baby doggie, little brother doggie, big sister doggie, big brother doggie, mommy doggie, and daddy doggie. During control conditions children learned to identify size sequencing in the stimuli, from the smallest to the biggest, before completing the test condition. In the switching condition children were asked to stamp the dogs and their matching bones in order from the smallest to the biggest (e.g., baby doggie and her bones, little brother doggie and his bones, etc.), requiring a shift between like-sized stimuli. Stamping errors were corrected by redirecting children to the last stimulus correctly stamped and instructing them to continue with the task. In addition, standardized feedback was provided to ensure all children received similar support. Task administration was discontinued when a child took more than 2.5 minute to complete a page. In total, 5 children (4%) had missing data due to non-compliance or examiner administration errors. Coding inter-rater reliability for this task was 96%.

Shape School (Espy, Bull, Martin, & Stroup, 2006; Espy, 1997) is a computerized task used to assess inhibition and switching skills. Two dependent variables were obtained from this task: Shape School-Inhibit and Shape School Switch. Before completing the task, children were presented on a computer screen four splashes of colors (blue, yellow, red, and green) and were asked to identify each one of the colors to ensure they could name the stimuli during the Shape School-Inhibit condition. A control condition was first administered to prime the prepotent color-naming response (i.e., blue vs. red). Children who were not able to correctly name the colors of the stimuli during the control condition received a score of zero in the inhibition condition (n = 10; 8%) and the task was discontinued. During the inhibit condition, children were told that the student characters were going to lunch, but only the students with “happy” faces were ready for lunch. Children were instructed to name each student that had a happy face (i.e., name color), but to stay quiet when they saw students with “sad” faces. Inter-rater reliability for the inhibition condition was 96%. After the inhibition condition, children were presented with a screen with four different figures (square, circle, rectangle, and star) and were asked to identify each one of them. A control condition with 12 trials was administered to prime the shape naming response (i.e., circle vs. square). Children who were not able to correctly name the shapes of the stimuli during the control condition received a score of zero in the switching condition (n = 15; 12%). During the test trials for the switching condition, children named the color of the stimuli without hats and named the shape of the stimuli wearing hats. Inter-rater reliability for the switching condition was 97%.

Snack Delay (adapted from Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996). This task is associated with inhibitory control skills. Before completing this task, children were asked to identify a picture of a snowman to ensure they understood the task and that the examiner used the appropriate Spanish label (e.g., mono de nieve, hombre de nieve, or muñeco de nieve) during task administration. Children were instructed to keep their hands on a mat placed on a table in front of them and were asked to “stand like a snowman” without moving or talking. A handful of small M&Ms was placed under a clear plastic glass in front of the child, and the child was asked to wait until the examiner rang a bell to eat the snack. The examiner performed various distracting actions while the child waited for 4 minutes to eat the M&Ms. At 15 seconds, the examiner dropped a pencil; at 30 seconds, the examiner cleared her throat; at 45 seconds, the examiner knocked under the table; at 60 seconds, the examiner said "uhmm ". At 90 seconds, the examiner lifted the bell as if to ring it, but did not ring it. At 120 seconds, the examiner said: "I forgot the red M&Ms in the other room, you stay here like a snowman without moving or talking while I go get them" and leaves the testing room. At 210 seconds the examiner returned to the room and finally rings the bell at 240 seconds. In total, four children had missing data for this task, two due to separation anxiety and one due to task non-compliance. Coding inter-rater reliability for this task was 95%.

Noisy Book (adapted from Hughes, Dunn, & White, 1998) is a computerized memory span task proposed to assess working memory skills. The Noisy Book is administered using a touch screen displaying 9 buttons with different colors and animal pictures presented in a 3 by 3 grid. Each button produces the corresponding animal sound when pressed (i.e., frog, duck, mouse, cat, cow, pig, chicken, sheep, and horse). During the practice phase, children were introduced to the game by pressing each button in order from left to right and naming the corresponding animal. Subsequently, the animal pictures were taken away and the buttons (without the animal pictures) were displayed in the screen. A set of 9 practice trials was presented to the child in which the examiner called the name of each animal and asked the child to identify the corresponding button. Children received a score of zero if they were not able to accurately identify the button associated with each animal. During the test trials, the examiner read sequences of animal names and the child was instructed to listen to all the animal names first in the trial sequence before touching the correct buttons in the order requested. Each test condition was composed of 3 trial sequences that started with 2 animals and progressively increased in length. The 3 trial sequences in each test condition include the same number of animal names. If the child correctly reproduced the first 2 trial sequences within a condition, the third sequence was omitted. Task administration was discontinued when the child incorrectly reproduced all 3 trial sequences within a test condition. In this task, 5 children had missing data as result of non-compliance or equipment difficulties. Coding inter-rater reliability for this task was 98%.

***Child Intelligence*.** Three intellectual abilities including child comprehension, fluid reasoning, and processing speed were assessed with the Verbal Comprehension, Concept Formation, and Visual Matching tests from the Woodcock Johnson-III Brief Intelligence Assessment (WJ-III BIA; Woodcock, McGrew, Mather; 2003). A general intellectual ability score based on the three subscales was used in the present study (*M* = 88.51, *SD* = 13.89).

General Analytic Strategy

Measurement and structural models were estimated using full information maximum likelihood estimation with robust standard errors (MLR) in Mplus 7.11 (Muthén & Muthén, 1998-2013). MLR has been recommended when working with non-normal outcomes and small sample sizes (Yuan, Chan, & Bentler, 2000). Overall model fit was evaluated based on three fit indices: the *Comparative Fit Index* (CFI), *Root Mean Square Error of Approximation* (RMSEA), and *Squared Root Mean Error Residual* (SRMR). The Chi-square (χ^2) test of model of fit is also reported. Briefly, CFI provides a test of goodness of fit, for which higher values are preferred. In general, a CFI value above .90 is considered acceptable (Hu & Bentler, 1999). RMSEA represents deficits in model fit, with lower values preferred. Generally, an RMSEA value below .08 is considered acceptable (including 90% confidence interval and non-significant test of close fit; Hu & Bentler, 1999). Finally, the χ^2 test of model fit is an index of how well the observed pattern of mean, variances, and covariances is accounted for by a specified model. A non-significant χ^2 is desirable for absolute model fit. Although χ^2 values are reported for all models examined, this index was not used as an indicator of model fit as absolute fit is a very strict criterion (see Bollen, 1989). In addition to overall fit, local model fit strains were evaluated by inspecting the normalized residual covariance matrix via the RESIDUAL output option in Mplus, in which values were calculated as: (observed covariance – expected covariance) / SD (observed covariance). Positive residual covariances were considered indicative that items were more related to each other than predicted, while negative residuals covariances were indicative that items are less related to each other than predicted. Omega reliability was calculated for each factor as the squared sum of the factor loadings plus the sum of the error variances plus twice the sum of the error covariances (Brown, 2006).

All models were identified by setting the latent factor mean(s) to 0 and the factor variance(s) to 1, while allowing all the intercepts, item factor loadings, and item residual variances to be freely estimated. Nested model comparisons were conducted using the rescale −2* the change in log-likelihood ($-2\Delta LL$), in which degrees of freedom are equal to the difference in the number of parameters between models. The models examined and specific analytic procedures for each study are presented in their respective chapters.

CHAPTER 3

Study 1: Validation of Executive Control Assessments

The purpose of study 1 was to evaluate the validity and reliability of five neurocognitive tasks assessing executive control in a sample of Hispanic preschool children. To this end, I first examined the model fit of a single-factor model of executive control that included the Go/No-Go, Trails, Shape School-Inhibit, Shape School-Switch, Snack Delay, and Noisy Book as indicators. Second, I evaluated the measurement equivalence based on the language in which the tasks were administered in (i.e., English or Spanish). Third, the association between maternal reports of child ADHD symptoms and the single-factor of executive control was evaluated as evidence for the construct validity of the executive control tasks.

Analytic Strategy

In preparation for data analyses, the five neurocognitive tasks were scored to obtain an observed accuracy score ranging from 0% to 100%. In addition, due to the strong ceiling effects observed in some of the tasks (descriptive statistics in their original scale presented in Table 3.1), accuracy scores were logit-transformed: Y = log(prob/(1-prob)). This transformation allows the factor to relate to a continuous, rather than a bounded, outcome. Because the logit does not exist for a probability of 1 (i.e., perfect accuracy scores), however, those scores were transformed into .999 instead. The logit transformed task variables were used in the remaining analyses.

Table 3.1

Descriptive Statistics for Neurocognitive Tasks Assessing Executive Control

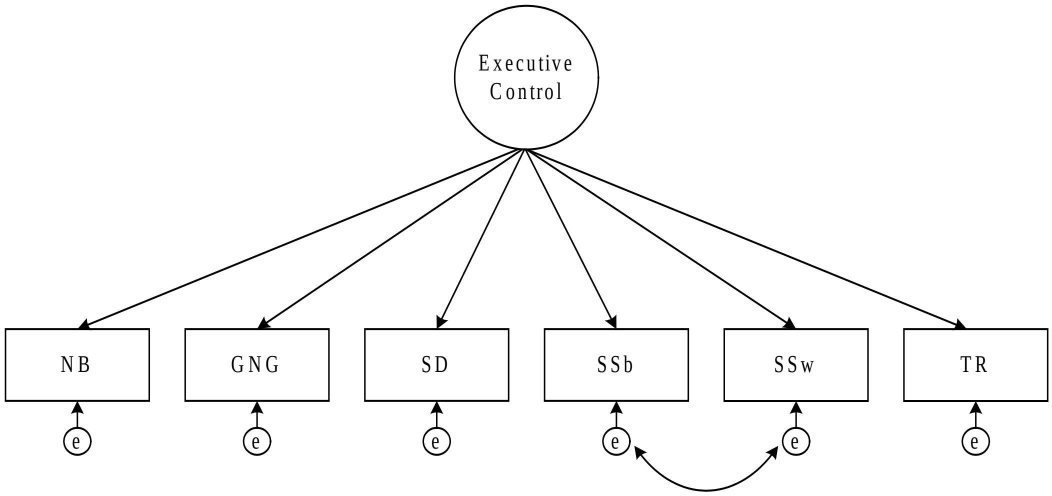
Task	*N*	*M*	*SD*	Observed Range	Skewness	Kurtosis
Go/No-Go	123	0.73	0.32	0 - 1	-1.18	0.09
Trails	123	0.84	0.13	.39 - 1	-1.02	0.89
Shape School (Inhibit)	118	0.86	0.23	0 - 1	-2.02	3.51
Shape School (Switch)	113	0.70	0.24	0 - 1	-0.64	-0.69
Snack Delay	124	32.84	12.96	0 - 48	-1.14	0.37
Nebraska Barnyard	123	5.79	2.55	1 - 12	0.34	-0.57

Note. Descriptive statistics reported in their original scale prior calculating percent correct or logit transformations.

Data analyses began by examining the extent to which the five neurocognitive tasks served as significant indicators of a latent executive control factor using CFA (see Figure 3.1 for graphic representation of proposed measurement model). All models were estimated under MLR to account for non-normality using Mplus v. 7.11 (Muthén & Muthén, 1998-2012). Model fit was evaluated based on the three fit indices: CFI, RMSEA, and SRMR (details regarding model fit evaluation are provided in Chapter 2). Although χ^2 values are also reported, they were not used as an indicator of overall model fit due to their sensitivity to sample size. Nested model comparisons were conducted using the rescaled $-2\Delta LL$ as explained in Chapter 2. All models were identified by setting the latent factor mean to 0 and factor variance to 1, while allowing all the item intercepts, factor loadings, and item residual variances to be estimated.

Figure 3.1

Measurement Model of Executive Control



Note. NB = Noisy Book; GNG = Go/No-Go; SD = Snack Delay; SSb = Shape School (inhibition condition); SSw = Shape School (switching condition); TR = Trails-P. Error covariance included between SSb and SSw conditions to account for potential task effects.

After identifying the best-fitting one-factor model of executive control, I examined the extent to which this model exhibited measurement invariance between children who were administered the tasks in English or Spanish by estimating a series of increasingly restrictive nested models. MLR estimation within Mplus was used in all analyses. Children who were administered the executive control tasks in English served as the reference group in all the invariance models considered. Nested model comparisons were evaluated using the rescaled $-2\Delta LL$ test. Measurement invariance testing started with the estimation of a configural invariance model in which the one-factor model of executive control was estimated simultaneously for both language groups. This model was identified by fixing the loading of one of the executive control indicators to 1 and the factor mean to 0 in each group. Fit of the configural invariance model was assessed using the global fit indices discussed in Chapter 2, including CFI, RMSEA, and SRMR. Additional models with increasing parameter constraints were estimated to identify significant decreases in model fit which would indicate measurement non-invariance across the groups.

Next, a metric invariance model was estimated to examine whether factor loadings were similar across the groups. To this end, all factor loadings were constrained to be equal across groups. The metric invariance model evaluates if the tasks are equivalently related to executive control across groups, indicating that the same latent factor is assessed in both groups. In line with my earlier stated criteria, only if partial metric invariance holds (i.e., at least 3 out of the 6 loadings are similar across groups), no further analyses would be considered.

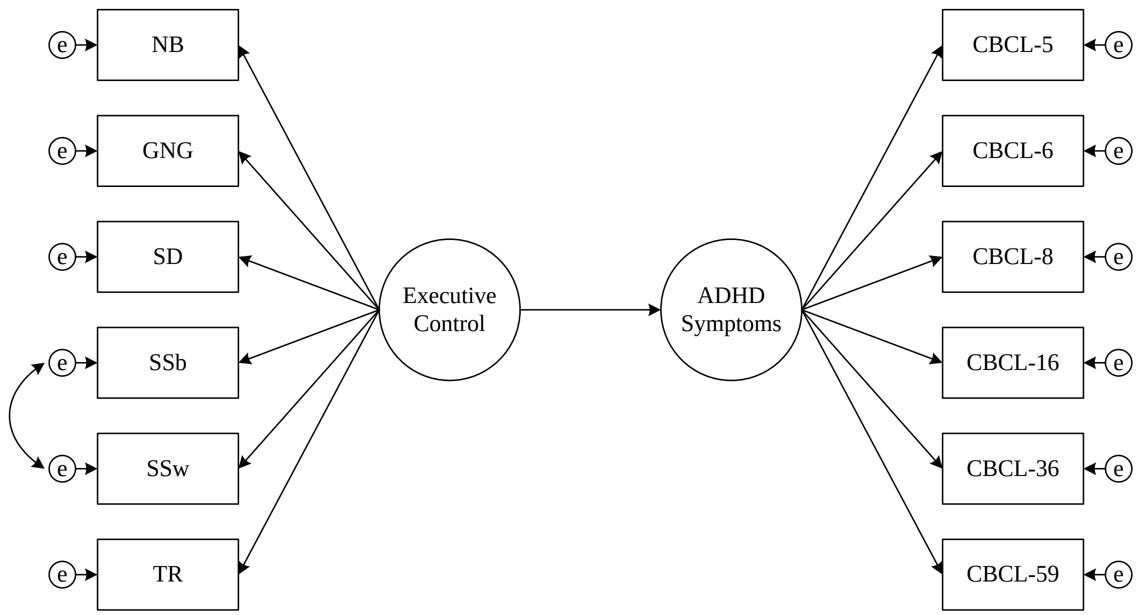
A scalar invariance model was then estimated to examine the equivalence of item intercepts across the groups. For the scalar model, the item intercepts were constrained to be equal across the groups. The scalar model evaluates whether observed differences in task performance between groups can be attributed to factor mean differences only.

Finally, a residual variance invariance model was estimated to determine the equality of residual variances across the groups. For the residual variance invariance model, all residual variances were constrained to be equal across the groups. The residual variance invariance model allows for the consideration of whether task variance not accounted for by the executive control factors was equal across groups.

After evaluating the measurement equivalence of the executive control factor across the language groups, an SEM was estimated to evaluate the construct validity of the neurocognitive tasks in which a single factor of executive control predicted a single factor of ADHD symptoms (see Figure 3.2). An additional model was estimated to determine whether executive control remained a significant predictor of ADHD symptoms after controlling for child sex, age, and intellectual ability scores.

Figure 3.2

Executive Control as Predictor of ADHD Symptoms



Note. NB = Noisy Book; GNG = Go/No-Go; SD = Snack Delay; SSb = Shape School (inhibition condition); SSw = Shape School (switching condition); TR = Trails-P.

Results

Measurement Models

Executive control. Zero-order correlations among the logit-transformed neurocognitive tasks are presented in Table 3.2. As can be seen, with the exception of Trails, the rest of the tasks were moderately correlated with each other (correlations presented in Table 3.2), suggesting the possibility that a one-factor model of executive control would appropriately describe the pattern of associations among the neurocognitive tasks. This possibility was empirically tested by estimating a series of confirmatory factor models.

Table 3.2

Zero-order Correlations among Executive Control Tasks

Task	1	2	3	4	5	6
1. Go/No-Go	—					
2. Trails	.20 *	—				
3. Shape School (inhibit)	.50 ***	.13	—			
4. Shape School (switch)	.48 ***	.19 *	.50 ***	—		
5. Snack Delay	.31 ***	.04	.55 ***	.38 ***	—	
6. Noisy Book	.38 ***	.02	.45 ***	.51 ***	.42 ***	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

The measurement model initially proposed—including Go/No-Go, Trails, Shape School-Inhibit, Shape School-Switch, Snack Delay, and Noisy Book as factor indicators and a residual correlation between inhibit and switch Shape School conditions—had an acceptable fit, χ^2 (8) = 14.59, p = .07, CFI = .96, RMSEA = .08, SRMR = .05. The factor loading for Trails, however, was not statistically significant (b = .07, SE=.11, p = .50). After removing Trails as a factor indicator, a second model of executive control was estimated with five indicators and a residual correlation between the inhibit and switch Shape School conditions. This model provided an acceptable fit, χ^2 (4) = 7.41, p = .12, CFI = .98, RMSEA = .08, SRMR = .03. Each task had a significant factor loading (standardized loadings ranging from .53 to .84); the residual correlation between Shape School-Inhibit and Switch conditions, however, was not statistically significant. After removing the residual correlation between the Shape School conditions, I estimated a third model with five indicators, which provided an acceptable fit to the data, χ^2 (5) = 8.50, *p* = .13, CFI = .98, RMSEA = .07, SRMR= .03. Modification indices suggested the need to add a residual correlation between Shape School-Inhibit and Snack Delay tasks, which have been previously identified as measures of inhibition (Wiebe et al., 2011). Thus, a residual correlation between Shape School-Inhibition and Snack Delay was added. This model had good fit, χ^2 (4) = 3.23, *p* = .52, CFI = 1.00, RMSEA = .00, SRMR= .02. Modification indices did not suggest the need for any additional associations among the tasks. Model parameter estimates for the final model, including item factor loadings, intercepts, and residual variances are presented in Table 3.3. As shown, all factor loadings were statistically significant, ranging from .57 to .74 with significant R^2 values ranging from .24 to .54, indicating that the single-EC factor accounted by 24% to 54% of the variance in each task. In addition, Omega reliability for the factor of executive control was .74, indicating acceptable for the five indicators (i.e., Go/No-Go, Shape School-Inhibit, Shape School-Switch, Snack Delay, and Noisy Book) of executive control.

Table 3.3

Final Measurement Model Parameters for Executive Control Factor

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Factor Loadings				
Go/No-Go	1.46	0.22	0.57	0.08
Shape School-Inhibit	1.53	0.20	0.74	0.06
Shape School-Switch	1.14	0.11	0.70	0.05
Snack Delay	0.89	0.18	0.49	0.08
Noisy Book	0.65	0.08	0.69	0.06
Item Intercepts				
Go/No-Go	1.63	0.23	0.63	0.12
Shape School-Inhibit	2.80	0.20	1.35	0.19
Shape School-Switch	1.16	0.15	0.71	0.09
Snack Delay	0.97	0.16	0.53	0.12
Noisy Book	-0.27	0.08	-0.29	0.10
Item Residual Variances				
Go/No-Go	4.54	0.80	0.68	0.09
Shape School-Inhibit	1.99	0.43	0.46	0.09
Shape School-Switch	1.37	0.24	0.51	0.07
Snack Delay	2.48	0.43	0.76	0.08
Noisy Book	0.45	0.09	0.52	0.08
Residual Correlation				
SSB with SD	0.58	0.29	0.26	0.11
R^2 for Item Variances				
Go/No-Go	—	—	0.32	0.09
Shape School-Inhibit	—	—	0.54	0.09
Shape School-Switch	—	—	0.49	0.07
Snack Delay	—	—	0.24	0.08
Noisy Book	—	—	0.48	0.08

Note. SSB = Shape School Inhibit, SD = Snack Delay; SE = Standard Error. All model parameters were statistically significant at $p < .05$.

ADHD. Zero-order correlations among the six items assessing ADHD are presented in Table 3.4. As can be seen, items 5, 6, 8, and 16 were moderately correlated with each other, while items 36 and 59 were moderately correlated with each other. Although a one-factor model was initially posited to account for the patter of associations across these items, this model resulted in poor fit, χ^2 (9) = 26.17, p = < .001, CFI = .57, RMSEA = .12, SRMR= .06. Non-significant loadings for item 36 and 59 were identified. In addition, modification indices suggested adding a residual correlation between items 36 and 59. After adding a residual correlation between items 36 and 59, an additional model was estimated, which resulted in poor fit, χ^2 (8) = 14.82, p = .06, CFI = .83, RMSEA = .08, SRMR= .05. Although the residual correlation between item 59 and 36 was significant (standardized coefficient .22, p = .03), the factor loadings for these items remained non-significant. Thus, a third model was estimated, after removing items 36 and 59, which resulted in good fit, χ^2 (2) = 1.10, p = .58, CFI = 1.00, RMSEA = .00, SRMR= .02. In addition, normalized residual covariances and modification indices did not produce interpretable remaining associations; thus, the one-factor model of ADHD symptoms, based on four indicators, was retained and used in the remaining analyses.

Table 3.4
Zero-order Correlations between ADHD Symptoms Items

Item	1	2	3	4	5	6
1. CBCL5	–					
2. CBCL6	.24 **	–				
3. CBCL8	.37 **	.15	–			
4. CBCL16	.35 **	.04	.20 *	–		
5. CBCL36	.02	.17	.12	.17	–	
6. CBCL59	-.04	.09	.11	.02	.22 *	–

Note. * p < .05, ** p < .01, *** p < .001.

Table 3.5 provides the final model estimates and their standard errors. All factors loadings were statistically significant. As shown in Table 3.5, the standardized loadings for the ADHD symptoms items ranged from .27 to .84. R^2 values were not significant and ranged from .08 to .71, this indicated that the one-factor did not significantly accounted for the variance in each task. Omega reliability was .60 for the ADHD factor suggesting low reliability for the four-item factor.

Table 3.5

Final Measurement Model Parameters for ADHD Symptoms Factor

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Factor Loadings				
CBCL5	**0.60**	0.17	**0.84**	0.23
CBCL6	**0.17**	0.08	**0.27**	0.12
CBCL8	**0.27**	0.10	**0.44**	0.16
CBCL16	**0.20**	0.07	**0.41**	0.12
Item Intercepts				
CBCL5	**0.68**	0.06	**0.96**	0.08
CBCL6	**0.54**	0.06	**0.87**	0.07
CBCL8	**0.37**	0.05	**0.60**	0.06
CBCL16	**0.27**	0.04	**0.56**	0.06
Item Residual Variances				
CBCL5	0.15	0.20	0.29	0.39
CBCL6	**0.36**	0.04	**0.93**	0.06
CBCL8	**0.30**	0.06	**0.80**	0.14
CBCL16	**0.19**	0.03	**0.83**	0.10
R^2 for Item Variances				
CBCL5			0.71	0.39
CBCL6			0.08	0.06
CBCL8			0.20	0.14
CBCL16			0.17	0.10

Note. SSB = Shape School Inhibit, SD = Snack Delay; SE = Standard Error. **Bold =** model parameters statistically significant at $p < .05$.

Measurement Invariance Models

After examining the measurement properties of the neurocognitive tasks for the entire sample, the possibility of performance difference resulting from whether the tasks were administered in English or Spanish was tested. As previously stated, the criterion I used to determine measurement equivalence across groups was partial metric and scalar invariance; that is, the loadings and intercepts of at least three of the six tasks had to be equivalent across the groups.

A configural invariance model was estimated to evaluate the model fit of the one-factor model of executive control, based on five indicators and a residual correlation within each language group. This model had good fit (see Table 3.5) indicating that the same factor structure was obtained across the groups.

The metric invariance model in which all factor loadings were constrained to be equal across groups fit well (see second row in Table 3.5), and did not result in a significant decrease in model fit relative to the configural model, $-2\Delta LL(4) = 2.31$, $p = .67$, thus suggesting that the tasks were related to the latent executive control factor equivalently across the groups; in other words, the same latent factor was being measured by the tasks in each group.

The scalar invariance model testing the equality of the item intercepts across the groups fit well (see third row in Table 3.5) and did not result in a significant decrease in model fit relative to the metric invariance model, $-2\Delta LL(4) = 4.07$, $p = .39$. Modification indices, however, suggested that allowing the intercept for Noisy Book to differ between groups would significantly improve the model fit. Thus, a partial scalar invariance model was estimated in which the intercept for Noisy Book was allowed to differ between the groups, resulting in a good-fitting model (see fourth row in Table 3.5). The partial scalar invariance model did not result in a significant decrease in model fit relative to the metric invariance model, $-2\Delta LL(3) = .09$, $p = .99$, indicating that both groups have the expected item response at the same absolute level of the underlying construct (i.e., EC); that is, any observed difference in the item means between groups is due to factor mean differences. This was true for all the tasks except for Noisy Book, for which children in the English groups were expected to have a higher item response compared to children in the Spanish group at the same absolute level of executive control.

The residual variance invariance model testing the equality of residual variances across the groups (except for Noisy Book) fit well (see fifth row in Table 3.5) and did not result in a significant decrease in model fit relative to the partial scalar invariance model, $-2\Delta LL(4) = 7.24$, $p = .23$, indicating that the amount of item variance not accounted for by the factor was similar across groups. Finally, the equality of the residual covariance between Shape School-Inhibit and Snack Delay across groups was tested and resulted in a non-significant decrease in fit relative to the residual invariance model, $-2\Delta LL(1) = 1.95$, $p = .23$, indicating that the residual association between Shape School-Inhibit and Snack Delay was not significantly different between the English and Spanish language groups. Modification indices however, suggested that allowing the residual covariance between Shape School-Inhibit and Snack Delay to differ between groups would result in significantly improved model fit. The residual covariance between Shape School-Inhibit and Snack Delay was thus allowed to vary across the groups.

In sum, as proposed, partial measurement invariance was observed for the English and Spanish version of the neurocognitive tasks, indicating that the relationships of the tasks to the latent executive control factor were equivalent regardless of the language in which the tasks were administered (except for the intercept and residual variance for Noisy Book). Model parameter estimates for the final (partial) invariance model (i.e., residual variance invariance) are presented in Table 3.6.

Table 3.6

Parameters for Final Executive Control Invariance Measurement Model

	English				Spanish			
	Unstandardized		Standardized		Unstandardized		Standardized	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Factor Loadings								
GNG	**1.17**	0.21	0.48	**0.08**	**1.17**	0.21	0.60	0.08
SSI	**1.25**	0.20	0.67	**0.08**	**1.25**	0.20	0.77	0.06
SSS	**0.93**	0.14	0.62	**0.07**	**0.93**	0.14	0.73	0.05
SD	**0.71**	0.17	0.41	0.09	**0.71**	0.17	0.53	0.08
NB	**0.51**	0.10	0.60	0.10	**0.51**	0.10	0.73	0.06
Intercepts								
GNG	**1.82**	0.28	0.75	**0.15**	**1.82**	0.28	0.68	0.13
SSI	**3.01**	0.24	1.61	**0.22**	**3.01**	0.24	1.37	0.18
SSS	**1.31**	0.19	0.88	**0.14**	**1.31**	0.19	0.76	0.10
SD	**1.08**	0.18	0.63	0.13	**1.08**	0.18	0.59	0.12
NB	0.00	0.13	-0.01	0.15	**-0.29**	0.13	-0.31	0.14
Residual Variances								
GNG	**4.58**	0.81	0.77	**0.07**	**4.58**	0.81	0.65	0.09
SSI	**1.94**	0.41	0.56	**0.10**	**1.94**	0.41	0.40	0.09
SSS	**1.36**	0.23	0.61	**0.08**	**1.36**	0.23	0.46	0.07
SD	**2.47**	0.42	0.83	0.07	**2.47**	0.42	0.72	0.09
NB	**0.47**	0.13	0.65	0.12	**0.41**	0.10	0.47	0.08
Residual Covariance	0.06	0.63	0.03	0.29	**0.74**	0.28	0.34	0.10
Factor Mean	0.00	0.00	0.00	0.00	-0.26	0.27	-0.19	0.18
Factor Variance	1.00	0.00	1.00	0.00	1.85	0.58	1.00	0.00

Note. GNG = Go/No-Go, SSI = Shape School Inhibit, SSS = Shape School Switch, SD = Snack Delay, NB = Noisy Book. Residual covariance between SSI and Snack Delay. SE = Standard Error. **Bold** parameters significant at least a $p < .05$.

Structural Models

After examining the measurement equivalence of the neurocognitive tasks, SEMs were estimated to examine child executive control as predictor of ADHD symptoms. The first model included a single path from executive control to child ADHD symptoms. This model had a good fit, χ^2 (25) = 18.97, CFI = 1.00, RMSEA = .00, SRMR = .04. Additional models were estimated to determine whether executive control remained a significant predictor of ADHD symptoms even after controlling for child age, sex, and intellectual ability. The final path coefficients are presented in Table 3.7. The final model included paths from executive control to ADHD symptoms while controlling for child age and intellectual ability (child sex was not a significant predictor of executive control and therefore was not included in the final model). This model had a good fit, χ^2 (39) = 38.41, p = .50, CFI = 1.00, RMSEA = .00, SRMR = .04. As can be seen, executive control remained a significant predictor of ADHD symptoms even after taking child age and intellectual ability into account. In addition, child age was positively associated with executive control, such that older children had higher executive. Similarly, child intellectual ability was positively associated with executive control, such that children with higher intellectual ability had higher executive control.

Table 3.7
Executive Control as Predictor of ADHD Symptoms Including Controls

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
ADHD Symptoms	**-0.42**	0.17	-0.38	0.13
Child Age	**7.18**	0.60	0.76	0.05
Intellectual Ability	**6.55**	1.22	0.47	0.08

Note. SE = standard error; **Bold** = regression coefficient significant at $p < .01$.

Summary

The aims of Study 1 was to determine the validity and reliability of a battery of neurocognitive tasks as assessments of executive control among Hispanic preschool children; to consider the measurement equivalence of the English and Spanish version of these task, and to demonstrate the construct validity of these tasks as assessments of executive control by examining its associations with maternal reports of child ADHD symptoms.

As predicted, with the exception of Trails, the neurocognitive tasks considered served as significant indicators of a single factor of executive control. The factor loadings for Go/No-Go, Shape School-Inhibit, Shape School-Switch, Snack Delay, and Noisy Book were all statistically significant and a one-factor model explained the pattern of associations among the tasks well. In addition, based on the measurement equivalence criterion I proposed (i.e., at least three of the task factor loadings/intercepts had to be equivalent across language groups), partial measurement equivalence was observed for the Spanish and English version of the neurocognitive tasks. Specifically, Go/No-Go, Shape School-Inhibit, Shape School-Switch, Snack Delay had equivalent factor loadings and intercepts between groups. The intercept for Noisy Book was not equivalent across groups; specifically, the intercept for Noisy Book was lower for the Spanish group. Moreover, the construct validity of the neurocognitive tasks as assessment of executive control was observed in the significant association between executive control and ADHD for the entire sample.

This study represents the first empirical effort to evaluate the measurement properties of neurocognitive tasks as assessments of executive control in Hispanic children. The results reported suggest that for Go/No-Go, Shape School-Inhibit, Shape School-Switch, Snack Delay, and Noisy Book are valid assessment for the evaluation of executive control among Hispanic children. Moreover, the Spanish and English version of the tasks had similar measurement properties, highlighting their appropriate utility to measure executive control in Spanish- and/or English-speaking Hispanic children. In addition, the significant association found between the latent executive control variable and maternal reports of child ADHD symptoms was similar to that found in studies with other populations (e.g., Espy et al., 2011), thus, providing further evidence for the appropriate use of these assessments to examine executive control in Hispanic children.

CHAPTER 4

Study 2: Child Bilingualism and Executive Control

The purpose of study 2 was to examine the association between child Spanish-English bilingualism and executive control performance. To this end, child bilingualism was evaluated using two different sources: maternal reports of child language use at home and child performance on English and Spanish standardized vocabulary assessments.

Analytic Strategy

The data analyses began by examining the extent to which the respective four items (see Appendix A for specific items) served as significant indicators of single-factors for child English- and Spanish- language use based on maternal reports. Measurement analyses were conducted via CFA as described in the analytic strategy section of Chapter 3. A series of path models was estimated to examine the associations between child language use at home and executive control. The first model included direct paths from child language use to executive control. The second model included the addition of child age, intellectual ability scores, and household income to executive control, to examine if the association between language use and executive control remained significant. The third model considered the interactive effect of Spanish and English child language use to executive control. The same models were then estimated using child English- and Spanish- vocabulary scores instead of maternal reports of child language use. To facilitate the interpretation of interactive association, observed predictors were mean-centered, including English vocabulary scores (0 = 75), Spanish vocabulary scores (0 = 80), child age (0 = 54 months), intellectual ability scores (0 = 88), maternal education (0 = some high school), and monthly household income (0 = $1,900).

Results

Measurement Models

Due to convergence issues originating from singular covariance matrices between the child English- and Spanish-language use factors, measurement analyses were estimated separately for each factor. The proposed one-factor model of child English language use fit well, χ^2 (2) = 5.15, p = .08, CFI = .98, RMSEA = .11, SRMR = .02, based on CFI and SRMR. In addition, Omega reliability for the factor of child English language use was .83, indicating good reliability for the four items. Similarly, the proposed one-factor model of child Spanish language use had good fit, χ^2 (2) = 6.95, p = .03, CFI = .98, RMSEA = .14, SRMR = .03, based on CFI and SRMR. Omega reliability for the factor of Spanish exposure at home was .84, indicating good reliability for the four items. The final measurement model parameters for the English and Spanish language use factors are presented in Tables 4.1 and 4.2, respectively. All of the measured parameters were statistically significant.

Table 4.1

Parameters for Final English Child Language Use Based on Maternal Report

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Item Loadings				
Item 1	0.82	0.08	0.84	0.04
Item 2	0.69	0.09	0.61	0.07
Item 3	0.79	0.09	0.66	0.06
Item 4	1.08	0.08	0.86	0.04
Item Intercepts				
Item 1	2.35	0.09	2.42	0.15
Item 2	3.57	0.10	3.14	0.21
Item 3	3.29	0.11	2.76	0.16
Item 4	2.66	0.11	2.13	0.12
Residual Variances				
Item 1	0.27	0.06	0.29	0.07
Item 2	0.81	0.11	0.63	0.08
Item 3	0.80	0.12	0.56	0.08
Item 4	0.40	0.09	0.26	0.06
R^2				
Item 1	—	—	0.71	0.07
Item 2	—	—	0.37	0.08
Item 3	—	—	0.44	0.08
Item 4	—	—	0.74	0.06

Note. All parameters significant at $p < .05$.

Table 4.2
Parameters for Final Spanish Child Language Use Based on Maternal Report

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Item Loadings				
Item 1	0.85	0.08	0.87	0.03
Item 2	0.67	0.09	0.59	0.07
Item 3	0.80	0.09	0.67	0.06
Item 4	1.09	0.08	0.87	0.03
Item Intercepts				
Item 1	3.64	0.09	3.74	0.30
Item 2	2.43	0.10	2.14	0.12
Item 3	2.73	0.11	2.28	0.13
Item 4	3.38	0.11	2.71	0.19
Residual Variances				
Item 1	0.22	0.05	0.24	0.06
Item 2	0.84	0.11	0.65	0.08
Item 3	0.79	0.12	0.55	0.08
Item 4	0.37	0.09	0.24	0.06
R^2				
Item 1	—	—	0.76	0.06
Item 2	—	—	0.35	0.08
Item 3	—	—	0.45	0.08
Item 4	—	—	0.76	0.06

Note. All parameters significant at $p < .05$.

Structural Equation Models

Child language use. The path model examining the association from the factor of child English language use to executive control exhibited acceptable model fit, χ^2 (25) = 41.24, p = .02, CFI = .96, RMSEA = .07, SRMR = .05, although child English language use was not significantly associated with executive control performance (standardized path = 0.07, p = .56). An additional model was estimated in which paths from control variables (i.e., child age, intellectual ability scores, and household income to child EC) were added. This model had acceptable fit, χ^2 (49) = 81.25, p = < .001, CFI = .93, RMSEA = .07, SRMR = .07. The association between child English language use and executive control remained non-significant even after controlling for child age, intellectual ability, and household income. The final path coefficients are presented in Table 4.3. Consistent with previous studies (e.g., Wiebe et al., 2011), age, intellectual ability, and household income were positively related to executive control.

Table 4.3
Paths from Child English Language Use to Executive Control

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
English Use	-0.10	0.16	-0.04	0.06
Age	**0.21**	0.04	0.77	0.05
IA	**0.07**	0.02	0.39	0.06
Income	**1.44**	0.35	0.25	0.05

Note. **Bold** = p <.05. IA = Intellectual Ability.

The path model examining the association from the factor of child Spanish language use to executive control provided an acceptable fit, χ^2 (25) = 44.11, p = .01, CFI = .95, RMSEA = .08, SRMR = .05; Spanish language use, however, was non-significantly associated with executive control (standardized path = -0.07, p = .56) . An additional model was estimated including paths from child age, intellectual ability scores, and household income to child executive control, which had acceptable fit, χ^2 (49) = 82.96, p = < .001, CFI = .93, RMSEA = .07, SRMR = .07. The association between child language use and executive control remained non-significant even after including control variables. The final path coefficients are reported in Table 4.4. Age, intellectual ability, and household income were again positively related to executive control. The interaction between English and Spanish language was not evaluated because the factors were not independent from each other.

Table 4.4
Paths from Child Spanish Language Use to Executive Control

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Spanish Use	0.10	0.15	0.04	0.06
Age	0.21	0.04	0.77	0.05
IA	0.07	0.02	0.39	0.06
Income	1.44	0.35	0.25	0.05

Note. **Bold** = p <.05. IA = Intellectual Ability.

Child vocabulary. The first model with paths from child Spanish and English vocabulary scores predicting child executive control performance fit well, χ^2 (12) = 14.97 p = .24, CFI = .98, RMSEA = .05, SRMR = .04. Both, child Spanish (standardized loading = 36, p < .01) and English (standardized loading = .67, p < .01) vocabulary scores were significantly associated with executive control. A second model was estimated including the addition of paths from control variables predicting executive control. This model had acceptable fit, χ^2 (24) =33.45, p = .10, CFI = .96, RMSEA = .06, SRMR = .04. Both, English (standardized loading = .27, p < .01) and Spanish (standardized loadings = .22, p <.01) vocabulary scores remained significantly associated with child executive control even after controlling for child age, intellectual ability, and family income. Finally, the interactive association between Spanish and English vocabulary scores to child executive control was considered by adding an additional path from the vocabulary interaction predicting executive control. This model fit well, χ^2 (28) = 35.84, p = .15, CFI = .97, RMSEA = .05, SRMR = .04; the vocabulary interaction, however, was not significantly associated with executive control. The final path coefficients are presented in Table 4.5.

Table 4.5

Paths from Child Spanish Language Use to Executive Control

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
English Vocabulary	**0.04**	0.02	0.28	0.08
Spanish Vocabulary	**0.03**	0.01	0.25	0.07
English*Spanish	0.00	0.00	-0.07	0.05
Age	**0.24**	0.06	0.72	0.06
IA	**0.07**	0.02	0.30	0.06
Low Income	**-1.41**	0.49	-0.21	0.06

Note. **Bold** = p <.05. IA = Intellectual Ability.

Summary

The aim of Study 2 was to consider child bilingualism, as assessed by maternal reports of child language use at home and child performance on standardized vocabulary assessments, to child executive control. Contrary to my predictions, child language use at home, as reported by mothers, was not significantly associated with child executive control. This finding is of interest as past studies (e.g., Barac & Bialystok, 2012) have relied on parent reports of child language use to identify child as bilingual children. In contrast, child performance on both English and Spanish vocabulary assessments was significantly associated with executive control, such that higher vocabulary scores predicted higher executive control. These associations were unique to scores in each language as the interaction between English and Spanish was not significantly associated with child executive control.

CHAPTER 5

Study 3: Sociocultural Factors and Executive Control

The purpose of Study 3 was to examine effects of family socioeconomic variables, parenting practices, cultural values, and acculturative stress in predicting child executive control. To this end, the psychometric properties of maternal reports of parenting, cultural values, and acculturative stress were first evaluated, followed by the estimation of a series of path models including independent and interactive associations from these variables to child executive control.

Analytic Strategy

Because some of the questionnaires included had not been used previously with Hispanic adults, a series of CFA models was first estimated to evaluate the fit of each factor based on the original scale items. After evaluating the fit of the original factors, I adopted the following criteria to remove problematic items within each subscales in order to make the assessments meaningful and efficient: 1) the items are age-appropriate for adult Hispanic women; 2) the items are clear, unambiguous, and not double-barreled; 3) the items significantly load on the factor. After establishing good model fit individually for all of the assessments included, plausible values were obtained for each factor using ESTIMATION = BAYES in Mplus (Asparouhov & Muthén, 2010). Plausible values are obtained from multiple data imputations using Bayesian estimation and are preferred over factor scores because they provide unbiased group-level estimates and provide a better distribution representation of a construct, especially when working with small samples. The obtained plausible values were then used to examine the independent and interactive effects of parenting, cultural values, and acculturative stress on child executive control.

Results

Measurement Models

Parenting. The extent to which 10 items served as significant indicators of nurturance and consistency was examined. A model was estimated in which 6 items served as indicators of nurturance and 4 items served as indicators of consistency. The two-factor model had an acceptable fit, χ^2 (34) = 50.32, p = .04, CFI = .94, RMSEA = .06, SRMR = .05. Residuals and modification indices suggested adding an error correlation between items 8 (i.e., My child can often talk me into letting him or her off easier than I had intended) and 13 (i.e., My child convinces me to change my mind after I have refused a request). An additional model was estimated with the added correlation between items 8 and 13, which had good a fit, χ^2 (33) = 37.66, p = .26, CFI = .98, RMSEA = .03, SRMR = .05.

The single factor of nurturance model had good fit, χ^2 (9) = 12.48, p = .18, CFI = .97, RMSEA = .05, SRMR = .04. The final parameters are presented in in Table 5.1. As can be seen, the standardized factor loadings for the items ranged from .41 to .60. Omega–based reliability was .94, indicating that the factor was highly reliable.

Table 5.1

Model Parameters for Final Nurturance Factor

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Item Loadings				
Item 1	0.41	0.09	0.44	0.10
Item 2	0.48	0.09	0.59	0.09
Item 3	0.42	0.10	0.41	0.11
Item 4	0.51	0.10	0.59	0.11
Item 5	0.50	0.07	0.77	0.06
Item 6	0.60	0.07	0.74	0.07
Item Intercepts				
Item 1	5.16	0.08	5.48	0.50
Item 2	5.37	0.07	6.56	0.64
Item 3	5.10	0.09	4.92	0.47
Item 4	5.28	0.08	6.10	0.63
Item 5	5.47	0.06	8.43	0.77
Item 6	5.23	0.07	6.50	0.56
Residual Variances				
Item 1	0.72	0.16	0.81	0.09
Item 2	0.44	0.09	0.65	0.10
Item 3	0.90	0.22	0.84	0.09
Item 4	0.49	0.14	0.66	0.13
Item 5	0.17	0.04	0.40	0.09
Item 6	0.29	0.08	0.45	0.10
R^2				
Item 1	—	—	0.19	0.09
Item 2	—	—	0.35	0.10
Item 3	—	—	0.16	0.09
Item 4	—	—	0.34	0.13
Item 5	—	—	0.60	0.09
Item 6	—	—	0.55	0.10

Note. All parameters significant at $p < .05$; SE = Standard Error.

The one-factor consistency model had good fit, χ^2 (1) = 12.48, *p* = .18, CFI = 1.00, RMSEA = .00, SRMR = .01. The final model parameters are presented in Table 5.2. As can be seen, standardized factor loadings for items ranged from .46 to .75. Omega reliability for consistency was .62, indicating that the factor was moderately reliable.

Table 5.2
Model Parameters for Final Consistency Factor

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Item Loadings				
Item 1	1.22	0.14	0.75	0.07
Item 2	1.22	0.15	0.78	0.08
Item 3	0.95	0.15	0.58	0.09
Item 4	0.72	0.16	0.46	0.10
Item Intercepts				
Item 1	4.09	0.14	2.60	0.15
Item 2	3.89	0.14	2.39	0.14
Item 3	3.86	0.14	2.36	0.14
Item 4	3.63	0.14	2.33	0.13
Residual Variances				
Item 1	0.97	0.32	0.39	0.13
Item 2	1.15	0.28	0.44	0.11
Item 3	1.76	0.30	0.66	0.11
Item 4	1.90	0.25	0.79	0.09
Residual Correlation				
Items 3 & 4	0.63	0.26	0.34	0.12
R^2				
Item 1	—	—	0.61	0.13
Item 2	—	—	0.56	0.11
Item 3	—	—	0.34	0.11
Item 4	—	—	0.22	0.09

Note. All parameters significant at $p < .05$; SE = Standard Error.

Cultural Values. The extent to which 24 items served as significant indicators of *familism* and *respect* was examined. Three different factor structures were considered to account for the pattern of associations among these items including 1) a four-factor solution with factors of Familism-Support (six items), Familism-Obligation (five items), Familism-Referent (five items) and Respect (eight items); 2) a higher-order factor of cultural values with familism and respect as lower-order factors, and 3) a one-factor solution of cultural values. All of the models considered resulted in poor model fit or estimation errors. Thus, I closely examined the content of each item to identify problematic items following the criteria previously described. Revisions to the cultural values assessment resulted in the selection of 8 items as indicators of a one-factor cultural values model, which had good model fit, χ^2 (20) = 19.05, p = .52, CFI = .99, RMSEA = .01, SRMR = .03. As presented in Table 5.3, the standardized factor loadings for the revised model ranged from .40 to .72. Omega reliability was .96, indicating that the single factor of cultural values was highly reliable. The final items are indicated in Appendix C.

Table 5.3

Model Parameters for Final Cultural Values Factor

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Item Loadings				
Item 1	0.37	0.09	0.45	0.10
Item 2	0.34	0.09	0.43	0.12
Item 3	0.65	0.09	0.72	0.07
Item 4	0.34	0.08	0.59	0.09
Item 5	0.43	0.10	0.65	0.10
Item 6	0.36	0.08	0.39	0.09
Item 7	0.32	0.06	0.50	0.09
Item 8	0.30	0.05	0.56	0.08
Item Intercepts				
Item 1	4.44	0.07	5.37	0.56
Item 2	4.55	0.07	5.76	0.69
Item 3	4.34	0.08	4.75	0.52
Item 4	4.70	0.05	8.09	0.95
Item 5	4.68	0.06	6.96	0.89
Item 6	4.19	0.08	4.61	0.40
Item 7	4.56	0.06	7.19	0.54
Item 8	4.73	0.05	8.98	0.90
Residual Variances				
Item 1	0.55	0.12	0.80	0.09
Item 2	0.51	0.14	0.81	0.10
Item 3	0.41	0.12	0.49	0.11
Item 4	0.22	0.04	0.66	0.10
Item 5	0.26	0.06	0.58	0.12
Item 6	0.70	0.13	0.85	0.07
Item 7	0.30	0.05	0.75	0.09
Item 8	0.19	0.05	0.69	0.09
R^2				
Item 1	—	—	0.20	0.09
Item 2	—	—	0.19	0.10
Item 3	—	—	0.51	0.11
Item 4	—	—	0.34	0.10
Item 5	—	—	0.42	0.12
Item 6	—	—	0.15	0.07
Item 7	—	—	0.25	0.09
Item 8	—	—	0.31	0.09

Note. All parameters significant at $p < .05$; SE = Standard Error.

Acculturative Stress. The extent to which 24 items served as significant indicators of acculturative stress was examined. A single factor including all of the original items had a poor fit, χ^2 (252) = 461.36, p = < .001, CFI = .80, RMSEA = .10, SRMR = .10. Due to the poor model fit, each item was evaluated to determine if they were applicable to the experience of adults, as this assessment was originally developed with college student samples (Mena et al., 1987). After removing non-applicable items, 7 items served as indicators of a single factor of acculturative stress, which fit well, χ^2 (14) = 19.69, p = .14, CFI = .98, RMSEA = .03, SRMR = .04. As presented in Table 5.4, the standardized factor loadings for the revised model ranged from .42 to .80. Final Omega reliability was .96, indicating that the factor model of acculturative stress was highly reliable. The final items are presented in Appendix C.

Table 5.4

Model Parameters for Final Acculturative Stress Factor

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Item Loadings				
Item 1	0.52	0.11	0.42	0.08
Item 2	0.82	0.11	0.57	0.07
Item 3	0.92	0.10	0.69	0.07
Item 4	0.98	0.10	0.74	0.06
Item 5	1.13	0.09	0.79	0.04
Item 6	0.97	0.10	0.80	0.05
Item 7	0.89	0.11	0.80	0.05
Item Intercepts				
Item 1	2.59	0.11	2.10	0.11
Item 2	2.95	0.13	2.03	0.11
Item 3	2.33	0.12	1.74	0.08
Item 4	2.20	0.12	1.67	0.07
Item 5	2.32	0.13	1.62	0.07
Item 6	1.91	0.11	1.58	0.07
Item 7	1.74	0.10	1.57	0.07
Residual Variances				
Item 1	1.25	0.14	0.82	0.07
Item 2	1.43	0.18	0.68	0.08
Item 3	0.94	0.17	0.53	0.09
Item 4	0.78	0.17	0.45	0.09
Item 5	0.78	0.14	0.38	0.07
Item 6	0.53	0.10	0.36	0.08
Item 7	0.45	0.10	0.36	0.09
R^2				
Item 1	—	—	0.82	0.07
Item 2	—	—	0.68	0.08
Item 3	—	—	0.53	0.09
Item 4	—	—	0.45	0.09
Item 5	—	—	0.38	0.07
Item 6	—	—	0.36	0.08
Item 7	—	—	0.36	0.09

Note. All parameters significant at $p < .05$; SE = Standard Error.

Correlations

Descriptive statistics for variables included in Study 3 are presented in Tables 1 and 2 in Appendix D. Bivariate correlations between executive control as a latent variable, household income and maternal education as observed variables, and maternal nurturance, consistency, cultural values, and acculturative stress as plausible values are presented in Table 1. As can be seen, of all the socio-familial variables considered, only household income was significantly correlated with child executive control; specifically, lower household income was significantly associated with lower child executive control. Household income was significantly correlated with maternal education, such that lower household income was associated with lower education. Household income was significantly correlated with maternal nurturance, such that lower household income was associated with higher maternal nurturance. Maternal education was significantly correlated with consistency, such that lower maternal education was associated with lower consistency. Nurturance was significantly correlated with cultural values, such that higher nurturance was associated with higher endorsement of cultural values. Finally, consistency was significantly correlated with acculturative stress, such that lower consistency was associated with greater acculturative stress.

To examine the possibility that the sociocultural variables were related to executive control at a task level, a separate set of correlation analyses were estimated to determine the pattern of associations between household income and maternal degree as observed variables, maternal nurturance, consistency, values and acculturative stress as plausible values, and each one of the tasks found to be a significant indicator of executive control (i.e., Go/No-Go, Shape School-Inhibit, Shape School-Switch, Snack Delay, and

Noisy Book). Bivariate correlations between socio-familial and executive control tasks are presented in Table 2. As can be seen, household income was correlated with child performance on Go/No-Go, Shape School-Inhibit, and Noisy book, such that lower income was associated with lower performance in these tasks. Maternal education was only significantly correlated with Go/No-Go, such that lower maternal education was associated with lower child performance on this task. Taken together, correlational analyses indicated that neither parenting (i.e., nurturance and consistency) nor culture related variables (i.e., values and acculturative stress) were significantly associated with executive control, even when considering each executive control task separately.

Structural Equation Models

A series of SEM was estimated to examine between-person differences in child executive control. Child age and intellectual ability were included as control variables in all models. The first path model included direct paths from household income, consistency, nurturance, cultural values, and acculturative stress to child executive control. This model had a good fit, χ^2 (32) = 40.89, CFI = .97, RMSEA = .04, SRMR = .04. The only significant paths were from child age, intellectual ability, and household income. Specifically, age and intellectual ability were associated with higher executive control, while low SES was associated with lower executive control. The coefficients for paths are presented in Table 5.5.

Table 5.5

Coefficients for Direct Paths to Child Executive Control

	Unstandardized		Unstandardized	
	Estimate	SE	Estimate	SE
Child Age	**0.21**	0.05	0.77	0.05
Child IA	**0.08**	0.02	0.40	0.06
Low Income	**-1.60**	0.39	-0.27	0.05
Consistency	-0.19	0.16	-0.09	0.07
Nurturance	0.73	0.59	0.11	0.09
Cultural Values	0.02	0.49	0.00	0.07
Acculturative Stress	0.08	0.22	0.03	0.07

Note. IA=Intellectual Ability. **Bold** = p < .05

Additional models including two- and three-way interactions were estimated to examine the possibility of interactive associations among household income, parenting (i.e., consistency and nurturance), and culture-related variables (i.e., cultural values and acculturative stress) in predicting child executive control. To facilitate the interpretation of the intercept and main effects, each predictor was mean-centered. Significant effects were retained, as well as any non-significant lower-order effects that were needed for significant interaction effects. After removing all non-significant paths, the model included predictive paths from child age and intellectual ability, household income, and a two-way interaction between income and nurturance, which fit the data well, χ^2 (24) = 41.00, CFI = .95, RMSEA = .06, SRMR = .05, and accounted for 85% of the variance in child executive control. The main and interactive effects for the final model are presented in Table 5.6. As can be seen, the significant main effect of low income indicated that executive control was lower by .26 for every additional unit of low income (for a child with a mean level of maternal nurturance). The main effect of nurturance indicated that executive control was non-significantly lower by .07 for every additional unit of maternal nurturance (for a child with a mean level of low income). This main effect, however, was not statistically significant. Finally, the low income by nurturance interaction indicated that the low income slope predicting executive control became more negative by .10 for each additional one unit increase in nurturance. In other words, the negative influence of low income became more negative with increases in nurturance. This interaction, however, was not statistically significant.

Table 5.6

Path Coefficients from Income and Nurturance to Executive Control

	Unstandardized		Standardized	
	Estimate	SE	Estimate	SE
Age	**0.21**	0.04	0.76	0.05
Intellectual Ability	**0.07**	0.02	0.40	0.06
Low Income	**-1.50**	0.37	-0.26	0.05
Nurturance	-0.45[a]	0.48	-0.07	0.07
Income by Nurturance	-1.64[a]	0.92	-0.10	0.06

Note. **Bold** = $p < .05$; a = $p < .10$.

Summary

The aim of Study 3 was to examine the effects of socio-familial and cultural factors in predicting child executive control. As predicted, lower family income was negatively associated with child executive control. In addition, this association remained significant even after controlling for child age and intellectual ability. Contrary to my predictions, neither nurturance nor consistency was significantly associated with child executive control. Similarly, neither cultural values nor acculturative stress were significantly associated with child executive control.

In line with extensive research documenting the negative associations between economic hardship and child executive control (e.g., Blair, 2010, Clark et al., 2013; Raver et al., 2012), low family income was associated with lower child executive control. Interestingly, maternal education, a frequently used indicator of SES, was not associated with child executive control. It is important to note that approximately 60% of the mothers included in this study did not complete high school. Potentially, in low income samples the influence of maternal education on executive control is not as important in the presence of economic hardship.

The finding that nurturance was not significantly associated with child executive control is consistent with other studies (Hughes & Ensor, 2009). Potentially, maternal nurturance was not associated with child executive control because these parenting behaviors do not directly influence child executive control, but rather set the emotional tone in of parent-child interactions. Furthermore, it is possible that nurturance alone does not have a significant association with child executive control unless combined with other parenting behaviors that support the development of child executive control. For instance, regardless of how nurturing a mother might be, if she does not scaffold child learning in an organized, age-appropriate manner, it is unlikely that nurturance alone would foster executive control. The non-significant association between maternal consistency and child executive control can potentially be attributed to the content of the items used to assess consistency. Specifically, all the consistency items were associated with contingent parental responses in the context of disciplinary acts. Perhaps, maternal consistency in diverse contexts is more likely to foster executive control when it guides child responses towards socially acceptable behaviors in everyday life.

The non-significant findings regarding the association between cultural values and acculturative stress to child executive control should be considered with caution. Specifically, the measurement properties of the questionnaires included to assess cultural values and acculturative stress exhibited poor measurement characteristics when considered in their original form. The revised versions included in the present study need to be validated with other Hispanic samples to evaluate their psychometric properties. Based on the preliminary findings reported in this study, neither maternal Hispanic cultural values nor acculturative stress are associated with child executive control. Although theoretical studies have called for the need to incorporate cultural variables in the development of self-regulation, a concept associated with executive control, it is possible that cultural factors may influence the behavioral manifestation of self-regulation, but not underlying cognitive processes, including executive control.

CHAPTER 6

General Discussion

The purpose of the studies presented in this dissertation was to evaluate the measurement properties of neurocognitive tasks as assessments of executive control in Hispanic preschool children and to identify linguistic and sociocultural factors that may be associated with individual differences in executive control. Specifically, the first study examined the measurement validity of neurocognitive tasks as assessments of executive control and considered whether the Spanish and English versions of executive control assessments held measurement equivalence. The second study examined whether child Spanish-English bilingualism was associated with executive control, even after taking family SES into account. The third study examined the associations between sociofamilial and cultural factors and child executive control.

Individually, each of the studies provided insight into the development of executive control. Collectively, the findings from these studies have important implications for understanding the development of executive control in Hispanic preschoolers. First, the neurocognitive assessments of executive control developed with non-Hispanic samples can be used with Hispanic children from diverse linguistic backgrounds. Second, child vocabulary in English and Spanish was associated with individual differences in executive control skills, above and beyond the contribution of family SES. Specifically, higher child vocabulary scores in English and Spanish were each associated with higher executive control. Third, low income was associated with lower executive control. Furthermore, positive parenting practices, maternal Hispanic cultural values, and acculturative stress did not appear to moderate this association.

The number of Hispanic children living in the U.S. will continue to grow; thus, there is a greater need for psychological assessments that are sensitive to the cultural and linguistic diversity of this ethnic group. Having valid assessments of executive control for Hispanic children represents the first step towards understanding the development of these important skills. Because executive control has been implicated in child socioemotional and academic outcomes, having valid assessments of executive control can lead to the early identification of developmental disruptions in these skills, which can inform early intervention and prevention efforts to foster the development of Hispanic children. The behavioral tasks included as indicators of executive control in this dissertation showed promising psychometric qualities in the assessment of skills associated with this construct in Hispanic preschool children from diverse linguistic backgrounds. It is worth noting that the executive control tasks were administered in a lab setting. Although there are many benefits to assessing child executive control in a lab setting, such methodological approaches are less practical when working with ethnic minority and low-income families, as many have limited transportation, unpredictable schedules, and are less familiar with lab settings. A useful line of future research will be the adaptation of lab-based executive control tasks to be administered in the field (e.g., Raver et al., 2011; Willoughby, Wirth & Blair, 2012)

The finding that Spanish and English vocabulary scores were associated with executive control provides some support for the generalizability of the bilingual executive control advantage reported in non-Hispanic bilingual samples (e.g., Barac & Bialystok, 2012). Specifically, child performance on English and Spanish vocabulary tests—but not maternal reports of child English and Spanish language use at home—were significantly associated with child executive control. It should be noted, however, that the effects of child English and Spanish vocabulary appeared to be additive, rather than interactive. Perhaps the bilingual advantage previously reported with non-Hispanic groups is the product of bilingual children having higher language abilities, resulting from their vocabulary knowledge in both languages in addition to cognitive flexibility (Calvo & Bialystok, 2014). This is an important point to consider, as language skills are frequently associated with higher performance in executive control assessments (Hughes & Ensor, 2005). More research is needed in this area to disentangle the factors that contribute to the bilingual advantage in executive control. Interestingly, the majority of empirical studies examining the effect of child bilingualism on executive control have relied on parental report of child language use to identify children as monolingual or bilingual (for a review see Bialystok, 2009); however, in the present dissertation parental reports of child English and Spanish use at home were not significant predictors of child executive control. These finding highlight the need for more comprehensive assessments of child bilingualism based on multiple sources of information.

In line with past research, household income had a significant effect on child EC in the present investigation; specifically, lower household income was associated with lower child executive control (e.g., Noble et al, 2007). Contrary to other studies (Bernier et al., 2010; Carlson, 2003; Hughes & Ensor, 2009; Matte-Gagné & Bernier, 2011), neither maternal nurturance nor consistency was associated with child executive control. It is important to note that parenting was assessed based on maternal self-reports, which are known to be influenced by social desirability motives (Henderson, 2012). In line with this contention, the majority of the mothers reported high levels of warmth and consistency. In addition, the parenting items asked mothers about their behavior during general interactions with their children and were not specific to scaffolding, which is the parenting process that has been consistently identified as fostering executive control (e.g., Bibok et al., 2009; Dilworth-Bart et al., 2010; Smith et al., 2000). Another explanation for the non-significant associations between maternal nurturance and consistency in the present study can be attributed to the general nature of the parenting items included. Specifically, most of the nurturance items were about efforts made by the mothers to foster emotional attachments with their children (e.g., my child and I have intimate moments together), while the consistency items were mostly about mothers' efforts to discipline their children in a consistent manner (e.g., "My child convinces me to change my mind after I refuse a request"; item reversed scored). Perhaps parenting practices that are more specific to fostering child skills associated with executive control, such as scaffolding, hold more promise for understanding the associations between parenting and child executive control. In addition, the non-significant associations between parenting and child executive control may be attributed to the poor reliability of the parenting assessments used, especially the consistency subscale.

Although emerging research has reported significant associations between culture-related variables and child self-regulatory competencies (Li-Grinning, 2012; Chase-Lansdale, Valdovinos et al., 2007; Melendez, 2005), in the present study, neither cultural values nor acculturative stress was associated with child executive control. It is possible that individual differences in executive control are mostly attributable to the learning resources present at home. Specifically, children from higher income households are more likely to have mothers with higher educational attainment, who provide more stimulating interactions with their children, including greater vocabulary and other skills necessary to complete the tasks included in the present dissertation (e.g., knowing colors, shapes, animal names and sounds). It is also possible that the cultural differences reported in child self-regulation might be due to conceptual differences between executive control and self-regulation. Although the terms executive control and self-regulation are often used interchangeably, self-regulation refers to the behavioral outcome of interacting internal processes manifested in everyday contexts; more importantly, not all self-regulation involves conscious responses (Kopp, 1992). Executive control, on the other hand, is often described as an internal state that coordinates responses in situations where automatic responses are not appropriate (Clark et al, 2013); thus, the deployment of executive control responses is more often conscious than responses associated with self-regulation. Although scholars have tried to theoretically explain the degree of conceptual overlap and differences among executive control and self-regulation, more empirical studies are need to clarify current conceptual discrepancies (Bridgett, Oddi, Laake, Murdock, & Bachmann, 2013).

Limitations and Future Directions

Although the findings reported provide initial information on the development of executive control in Hispanic children, the following study limitations should be considered. First, the study participants were mostly from low-income families who primarily spoke Spanish at home and had low maternal educational attainment. Although the studies in this dissertation provide preliminary insight into the executive control of a group of children not previously included in this research area, the findings reported should be interpreted with caution as these might not generalize to other populations.

Second, the measurement quality of the maternal questionnaires was poor, particularly for questionnaires in which a summary score is often used. Further studies using CFA are needed to assess the measurement validity of these assessments with recent Hispanic immigrants from low SES, especially since the participation of this population in empirical studies is limited. Third, socioeconomic variables were restricted to household income and maternal education, which limits our understanding regarding the specific mechanisms through which sociocultural variables influence executive control. Finally, the use of cross-sectional data limits the ability to make causal inferences.

Based on the preliminary findings reported in this dissertation, future studies will benefit from the inclusion of multiple reporters of parental behavior in order to obtain more accurate assessments of their behavior. In addition, questionnaires regarding the cultural values and sources of acculturative stress in Hispanic families need to be updated to better capture the realities in a wider range of Hispanic families, including recent Hispanic immigrants of low SES. The Hispanic population in the U.S. represents a heterogeneous group with diverse socioeconomic characteristics. For instance, a recent immigrant is more likely to experience acculturative stress as a result of adapting to a new context, while a U.S.-born Hispanic may be well established but may be adversely affected by discrimination and prejudice. Finally, more information is needed regarding the specific mechanisms through which socioeconomic factors influence child executive control, including academic stimulation at home and parents’ psychological well-being.

Perhaps the biggest challenge to the future of research in this area is the lack of conceptual clarity regarding the definition of executive control. Despite the growing number of studies on executive control, there is a general lack of consensus regarding the skills that should be considered as indicators of this construct. Specifically, different research teams have developed or modified behavioral tasks to assess executive control in preschool children, which has resulted in differences in the observed structure of this construct as well as discrepancies in its association with other variables. The use of CFA allows for the determination of the factor structure of executive control by identifying the shared variance among collections of tasks. It is important to note, however, that this statistical approach must be theoretically and conceptually informed in order to provide any meaningful interpretation. As long as researchers continue using and developing different assessments of executive control, the lack of consensus regarding the conceptualization and measurement of this construct will continue.

A common practice that has hindered the progress of research in this area is the lack of communication among diverse sub-disciplines within the field of psychology (e.g., Bridgett, Oddi, Laake, Murdock, & Bachmann, 2013). For instance, developmental scholars frequently approach the study of self-regulation using a temperament framework and prefer the use of the term *effortful control* (e.g., Rueda et al., 2005), while clinical, cognitive, and neuroscience investigators favor the use of *executive control* or *executive function*. An important task is to determine the degree of conceptual overlap and differences among these terms. Some investigators have argued for theoretically distinguishing between effortful control and executive control (e.g., Blair & Ursache, 2011; Liew, 2012) while others have argued for a substantial overlap between these constructs (e.g., Rueda et al., 2011). Despite the diverse opinions regarding the conceptual differences and similarities between effortful control and executive control, no studies have empirically considered such similarities and differences. Future studies will benefit from more integrated approaches to the study of self-regulation (Zhou, Chen, & Main, 2012). Only after a clear conceptualization of self-regulation is found can we truly begin to examine the impact of sociocultural and linguistic factors on the development of these skills.

Another important conceptual and methodological issue that future studies will need to address is how best to define and assess bilingualism. Although most studies have relied on the use of parent reports of child language use to determine child bilingualism (e.g., Barac & Bialystok, 2012), findings from Study 2 suggest that child language assessments have greater predictive value. Interestingly, the effects of Spanish and English child vocabulary scores were additive but not interactive. This finding suggests that having greater vocabulary, regardless of language, had a positive effect on executive control. An interesting observation during data collection was the children's mixed use of Spanish and English during the actual assessments. As described in the methods section, the examiner administered the tasks in English or Spanish based on mother's report of the child's language use and child performance on Spanish and English vocabulary assessments; children, however, were allowed to use either language to respond, and many of the children switched between English and Spanish throughout the assessment. For instance, it was not uncommon for children to know the name of colors, shapes, and animals in English, but not in Spanish. Further research is needed to determine if language code switching during the completion of behavioral tasks has any effect on performance. In addition, a richer conceptualization of bilingualism is needed as it is unlikely that bilingual individuals have the same language ability in both languages. Treating bilingualism as a categorical variable, as it has been done in most studies, fails to capture the nuances of such skills. In addition, because child language skills are likely influenced by specific contexts, future studies should include a more comprehensive assessment of child language use in multiple contexts using child assessments as well as information from multiple reporters.

Finally, while empirical evidence has supported the moderating role of socio-cultural variables on the association between family SES and child development (Galindo & Fuller, 2010; Gamble & Modry-Mandell, 2008; Li-Grining, 2012), this is only one of many ways in which these variables can be associated (Bornstein & Güngör, 2009). Researchers interested in this area should consider more complex models in which socioeconomic, parenting, and cultural variables might be associated in different ways. Perhaps parenting serves as a mediator in the associations between family SES and child EC. In addition, cultural values may mediate the associations between parenting and child executive control.

Conclusions

Although research on the development of executive control during the preschool years continues to be active, most studies continue to focus on the experiences of non-Hispanic children. An important challenge for the future is to ensure that this research is expanded to include the diverse experiences of Hispanic children and their families as well as addressing the lack of conceptual clarity regarding executive control and other self-regulation related constructs. As the Hispanic population continues to increase, the need to study child development from a linguistic and culturally sensitive perspective will continue. In addition, considering that the majority of Hispanic children live in disadvantaged environments, it is crucial to identify factors that may contribute to individual differences in executive control, as this information can be helpful in the early identification of children who may be at a heighted risk for academic failure or developmental difficulties later in life.

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Appendix A

Prescreening Form

1. Parent/Guardian Name: ____

2. Child's Name: ____

3. What is your child's date of birth? _____/_____/______ (*month/day/year*)

4. What is your child's sex? *(Check one)* □ Male □ Female

5. What is your child's ethnicity? *(Check one)*

□ Hispanic/Latino □ Non-Hispanic/Latino

6. Has this child been diagnosed with a disability or medical problems?

□ Yes □ No

6a. *If YES, specify*: ________________________

7. Do you live in Lincoln? □ Yes □ No

7a. *If NO*, please list the name of the community where you live: _____________

8. What language(s) does your child speak? (*list all*) _____________________________

9. What language does your child speak the most? (*select one option*)

□ English □ Spanish □ Both, English & Spanish □ Other, *specify*: ________

<u>Contact Info:</u>

Phone #: _________________________ Cell#: ______________________

Work/Alternative Phone #: ___________________________

Best time to call:

____

10. Which language do you prefer? *(Check one)*

□ English □ Spanish □ Both, English & Spanish □ Other, *specify*: _______

Appendix B
Screening Form

1. Child's name: ____

2. Parent/Guardian Name: ______________________________________

3. Screening Date: _____/_______/___________ (*month/day/year*)

4a. Screener: ____________________4b. Referred by: __________________________

I need to ask you a few questions to determine if you and your child are eligible to participate in this study.

Language Fluency

The first thing I need to do is to ask you a few questions about your child's use of language.

5. What language did your child learn first when he/she began to talk?
   - □ English
   - □ Spanish
   - □ Both, English & Spanish at the same time

The following questions are over your child's use of language. When answering these questions please think of a percentage between 0% to 100%.

1 ***Never*** **(0%)**	**2** ***Some of the time*** **(25%)**	**3** ***Half the time*** **(50%)**	**4** ***Most of the Time*** **(75%)**	**5** ***Always*** **(100%)**

SPANISH	**ANSWER**				
In general…	0%	25%	50%	75%	100%
In your home, what percentage of the time does your child speak in Spanish?	1	2	3	4	5
Of the times your child watches television, what percentage is in Spanish?	1	2	3	4	5
When your child talks with his/her friends, what percentage of the time is in Spanish?	1	2	3	4	5
When your child talks with his/her siblings, what percentage of the time is in Spanish?	1	2	3	4	5

7. At what age did you (or anyone) start speaking Spanish to your child?

______*years*   _______*month*   OR   _____don't speak to child in Spanish

ENGLISH	**ANSWER**				
In general…	0%	25 %	50 %	75 %	100 %
In your home, what percentage of the time does your child speak in English?	1	2	3	4	5
Of the times your child watches television, what percentage is in English?	1	2	3	4	5
When your child talks with his/her friends, what percentage of the time is in English?	1	2	3	4	5
When your child talks with his/her siblings, what percentage is in English?	1	2	3	4	5

9. At what age did you (or anyone) start speaking English to your child?

______*years* ________*month* OR _____don't speak to child in English

Medical History

Now I have some questions about your child's medical history.

10. When your child visits the doctor or clinic for medical care, how are the bills paid? (***Screener:*** *Check all that apply*)

□ Medicaid
□ CHIP (Children's Health Insurance Program)
□ Private Insurance
□ SSI
□ Self (Parents)
□ Relatives
□ Champus (Civilian Health and Medical Program of the Uniformed Services)
□ Other (*specify*): ________________________

11. Was your child born early, before your due date? □ Yes □ No

11a. *If yes*, how many weeks early? __________

12. What was your child's birth weight? ____ lbs ____oz

13. How long was your child hospitalized after birth? _____________days

13a. *If more than 3 days,* why was your child hospitalized for?

____

14. Where there any complications experienced during birth? □ Yes □ No

14a. If yes, specify:

____

15. Has your child been screened or tested for lead exposure? □ Yes □ No

15a. If yes, what was the level of lead? ________________________

16. At what age did your child first do the following?
(***Screener:*** *write what parent says in months*)

a. Sat Alone ______ c. Spoke First Word _______
b. Walked alone ______ d. Toilet Trained _______

17. Does your child receive any therapy? □ Yes □ No

□ Speech therapy (*no bilingualism*) □ Occupational Therapy
□ Physical therapy □ Counseling
□ Other, *specify*: ____

18. **I am going to read you a list of medical conditions. Please tell me if your child has experienced, or currently is experiencing, any of these medical conditions.** *(**Screener:** For any condition checked, ask if the child was diagnosed by a pediatrician or psychologist, if the child received any treatment or intervention, and note the date).*

	Illness or Condition	**Date/Age – Diagnosis/Treatment Details**
□ Y □ N	**Meningitis** *(inflammation of membranes that covers brain and spinal cord)* Admitted to hospital? □ Yes □ No	
□ Y □ N	**Encephalitis** *(inflammation of the brain)* Admitted to hospital? □ Yes □ No	
□ Y □ N	***High Fever or Febrile Seizures** Type:_____________________ *NE if seizures*	
□ Y □ N	***Epilepsy, Seizure Disorder or Convulsions** *NE*	
□ Y □ N	***Neurological Disorder** *(Ex. Cerebral Palsy or, Brain Tumors)* Type: __________________ *NE*	
□ Y □ N	****Paralysis*** Type: __________________ *NE*	
□ Y □ N	****Loss of consciousness** Imaging scan done? □ Yes □ No	

	Admitted to hospital? □ Yes □ No *NE if also head injury*	
□ Y □ N	****<u>Head Injury</u>** Type: ____________________ Imaging scan done? □ Yes □ No Admitted to hospital? □ Yes □ No *OK if not loss of consciousness or normal MRI*	
□ Y □ N	**<u>Frequent or severe headaches</u>**	
□ Y □ N	**<u>Genetic or Congenital Disorder</u>** *<u>(Physical or genetic abnormalities- Ex. Sickle-cell anemia or birth defects)</u>* Type: ________________________	
□ Y □ N	***<u>Fetal Alcohol Syndrome or Fetal Alcohol Spectrum Disorders</u>** *NE*	
□ Y □ N	**<u>Wetting/Soiling Problems</u>**	
□ Y □ N	**<u>Chronic Ear Infections</u>**	
□ Y □ N	**<u>Sleep or Appetite Problems</u>**	
□ Y □ N	***<u>Intraventricular brain hemorrhage/disorder</u>** *NE*	
□ Y □ N	***<u>Autism or other Pervasive Developmental Disorder</u>** *NE*	
□ Y □ N	**<u>Fainting Spells or Dizziness</u>** Type:____________________	
□ Y □ N	***<u>Developmental Delay or Mental Retardation</u>** *NE*	
□ Y □ N	**<u>Hearing Problems</u>** Type: ______________________ *Must be able to hear clearly*	
□ Y □ N	**<u>Visual Problems</u>** Type: ______________________ *Must be able to see clearly (glasses OK)*	
□ Y □ N	***<u>Language or Speech Problems</u>** Type: ______________________ *Receiving Language/Speech services are ineligible (except bilingualism)*	
□ Y □ N	***<u>Learning Disability</u>** Type: ______________________ *NE*	

□ Y	□ N	***Conduct, Oppositional, or Behavioral Disorder** *NE*	
□ Y	□ N	***Attention Deficit/ Hyperactivity Disorder** *NE*	
□ Y	□ N	***Psychiatric Disorder** *(Depression or Anxiety)* Type: ______________________ *NE*	
□ Y	□ N	**Clumsiness/Gross Motor Problems** Type: ___________________	
□ Y	□ N	**Writing/Fine Motor Problems** Type:____________________	
□ Y	□ N	**Asthma**	
□ Y	□ N	**Other** (describe):	
**Excluding condition; **Excluding conditions if paired with other conditions.*			

19. Is your child currently taking any medication? □ Yes □ No

Appendix C

Study Questionnaires

The Child Behavior Checklist for Ages 1½–5 : ADHD Symptoms—Revised Version (CBCL 1½–5; Achenbach & Rescorla, 2000)

1. Can’t Concentrate
2. Can’t sit still
3. Can’t wait
4. Demanding

Parenting Dimension Inventory—Short Version (PDI-S; Power, 2002)

Nurturance

1. I encourage my child to talk about his or her troubles.
2. My child and I have warm intimate moments together.
3. I encourage my child to be curious, to explore, and to question things.
4. I find it interesting and educational to be with my child for long periods.
5. I make sure my child knows that I appreciate what he or she tries to accomplish.
6. I respect my child’s opinion and encourage him/her to express it.

Consistency (*Note.* all items were reversed-scored)

1. Sometimes it is so long between the occurrence of a misbehavior and an opportunity for me to deal with it that I just let it go.
2. There are times I just don’t have the energy to make my child behave as he or she should.
3. My child can often talk me into letting him or her off easier than I had intended.
4. My child convinces me to change my mind after I have refused a request.

Mexican American Cultural Values Scale—Revised Version
(MACVS; Knight et al., 2010)

1. Older children should take care of and be role models for their younger brothers and sisters.
2. Children should be taught to always be good because they represent the family.
3. Children should respect adult relatives as if they were their parents.
4. Children should be on their best behavior when visiting the homes of friends or relatives.
5. Children should always honor their parents and never say bad things about them.
6. Children should follow their parents' rules, even if they think the rules are unfair.
7. It is important for children to understand that their parents should have the final say when decisions are made in the family.
8. Children should always be polite when speaking to any adult.

The Societal, Attitudinal, Familial, and Environmental—Revised Version
(SAFE; Mena et al., 1987)

1. I have more barriers to overcome than most people.
2. In looking for a good job, I sometimes feel that my ethnicity is a limitation.
3. Many people have stereotypes about my culture or ethnic group and treat me as if they are true.
4. I often feel ignored by people who are supposed to assist me.
5. Because I am different I do not get enough credit for the work I do.
6. Because of my ethnic background, I feel that others often exclude me from participating in their activities.
7. People look down upon me if I practice customs of my culture.

Appendix D

Bivariate Correlations

Table 1.

Standardized Correlations between Executive Control and Socio-Familial Variables

Variables	1	2	3	4	5	6	7
1. Executive Control	—						
2. Income	-.22*	—					
3. Mom Degree	-.17+	.26**	—				
4. Nurturance	.24+	.18*	-.04	—			
5. Consistency	.02	-.06	-.22*	.14	—		
6. Values	-.01	.20+	.11	.35***	-.02	—	
7. Acculturative Stress	.04	.06	.16+	.02	-.30**	.01	—

Note. +*p* <.10, **p* < .05, ***p* < .01, ****p* < .001.

Table 2.

Standardized Correlations between Logit Transformed Executive Control Tasks and Socio-Familial Variables

Variables	Income	Degree	Nurturance	Consistency	Values	Stress	*M*	*SD*
Go/No-Go	-.19*	-.21*	.01	-.08	-.21+	.06	.73	.32
Shape School-Inhibit	-.10	.10	.11	.09	-.01	.05	.86	.23
Shape School-Switch	-.24*	-.17+	-.02	-.23+	.18	.13	.70	.24
Snack Delay	.10	.01	-.01	-.02	.13	.04	.68	.27
Noisy Book	-.18*	.03	.16	.20	-.09	-.16	.45	.20

Note. +*p* <.10, **p* < .05, ***p* < .01, ****p* < .001.